Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS

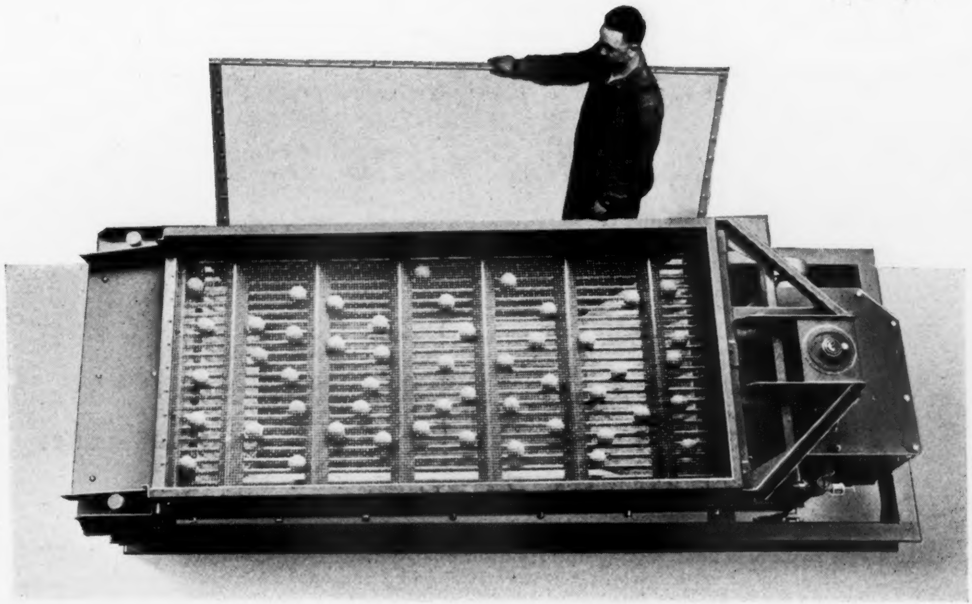
Founded 1896

Chicago, June 8, 1929 (Issued Every Other Week) Volume XXXII, No. 12

MEMBER A. B. C. *The Only Paid Circulation covering the Rock Products Industry* MEMBER A. B. P.

Printing of This Issue Is 5700 Copies. Next Issue Will Be June 22

ROTEX



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Contents for June 8, 1929

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Volume XXXII Chicago, June 8, 1929 No. 12

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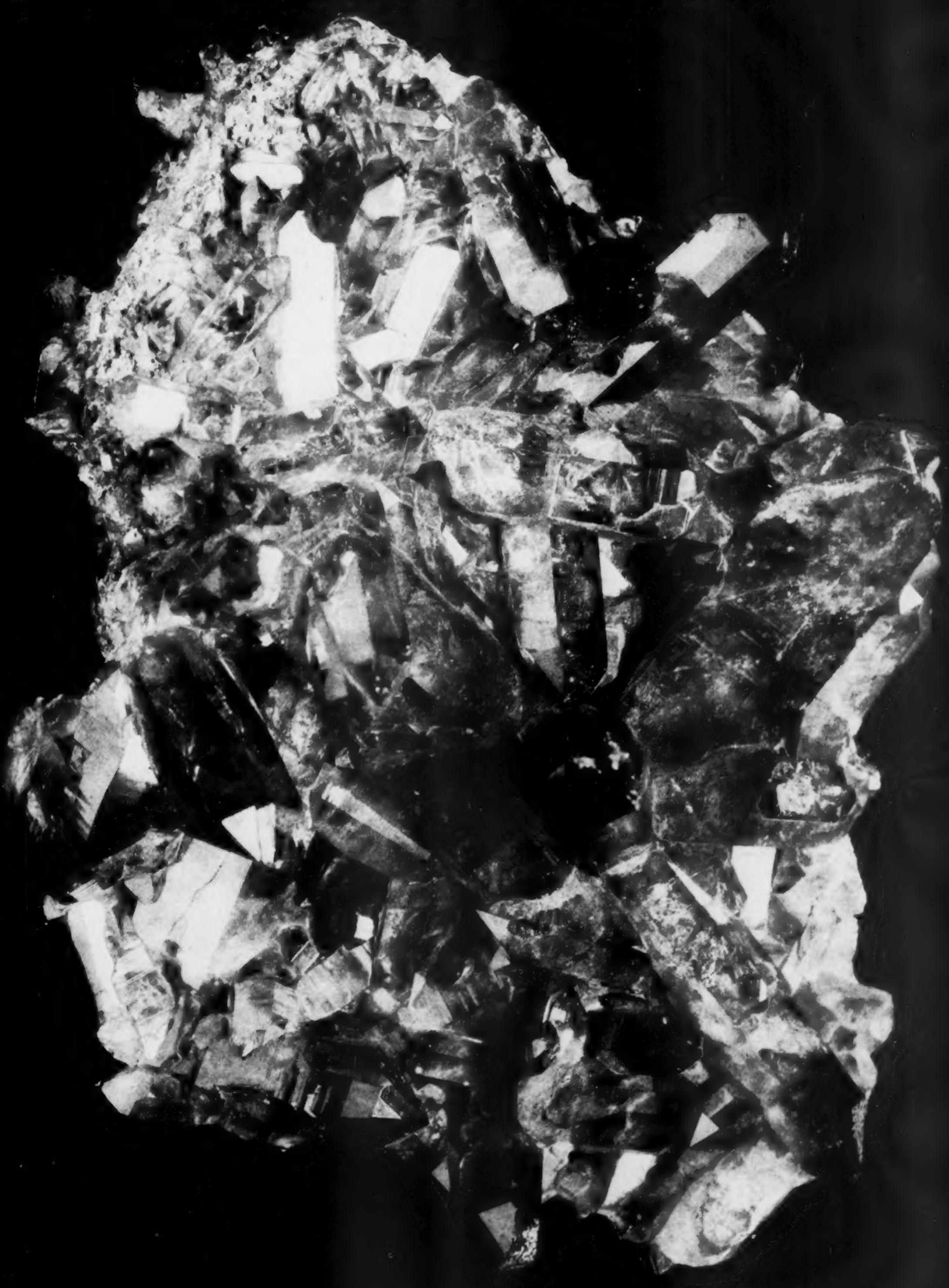
CEMENT and ENGINEERING NEWS



Crystals of quartz under the microscope—See article following on the "Fine Structure of Quartz"

The Fine Structure of Quartz

The Romance in a Grain of Sand

By H. W. Elkinton
Philadelphia Quartz Co., Philadelphia, Penn.

A TINY GRAIN of sand represents a very minute particle of this vast earth. A grain of sand is a symbol in literature of something very, very small. Nevertheless, if we put a single grain of sand under the microscope, a series of other worlds will immediately appear. Subject it to the searching eye of the X-ray and diagrams of its real intimate internal structure will become visible. Treat it to chemical reagents and more astonishing facts are found regarding the atomic and leptonic relationships that exist in this very huge thing, a tiny grain of sand.

Consider a quartz crystal. A crystal is the respectable brother of the rowdy sand grain, grains which usually have been subjected to the beating and battering of countless years of geologic time, broken down by frost, driven by winds and washed back and forth by innumerable waves. The crystal has not had such a knocking about, consequently it is more legible; that is, one can follow its edges, count its faces and examine its features as one can read the pages of a well-kept book.

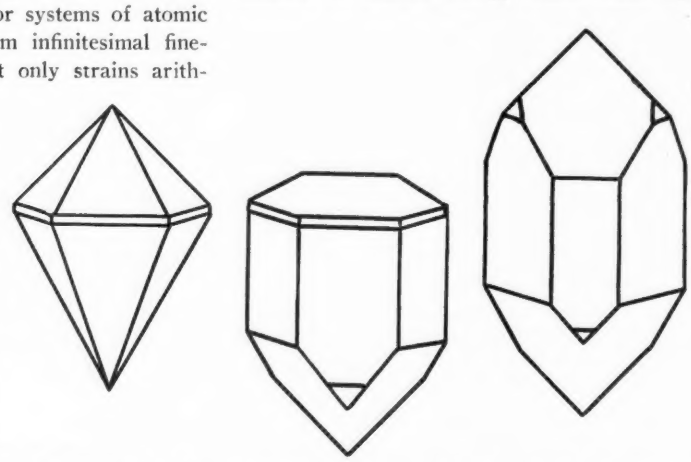
Crystals Typify Construction

Crystals are also an open door to much of our knowledge of the structure of matter. Friederich Rinne has said with much pith: "It is recognized that crystals are actually, in many respects, typical of the general conception of the constitution of matter. In their microscopic form and their physico-chemical relations are reflected not only the fine-structure and the physics and chemistry of their own particular microcosm, but also of matter in general." Probably the most startling use of crystals in the search of the key to the atomic structure of matter was through the research of M. Laue, who in 1912 stumbled upon the value of crystals as gratings for splitting the rays of the X-rays so that the monochromatic rays and the polychromatic rays could be registered separately on a photographic plate. The tiny dots that show in this separation are now classic pictures in the history of science.

Laue should have the credit for flinging open the door, but it had been set ajar by LeChatelier, who in his book, "La Silice et les Silicates" (Chap. 4, pp. 7-124), describes very carefully the more obvious physical characteristics of quartz crystals. The symmetry of edge is in itself an attraction. The transparence of pure quartz is always hard for me to pass by. When one can see with no difficulty at all through 6 in. of pure silica, I am always moved by the great purity of such transparent matter. The great range in size of specimens is impressive, which vary from tiny crystals that have to be moved about with a hair to the largest quartz crystal in museum captivity, at Naples, a specimen weighing over 2 tons. The growth of the leptons or systems of atomic nuclei which grow from infinitesimal fineness to a size that not only strains arithmetic but also adds to the list of miracles in the physical world. No microscope has as yet been developed to disclose the precise position of the atom. Instruments have been developed, according to Abbé, that can see down to about 0.0005 mm. (5×10^{-5} cm.). Our troubles are due to the wave length of light that is available to the eye, or the light that can be used in photography, which is too coarse for the fineness of the lepton. To quote Rinne, "The atoms are a thousand times smaller (only about 10^{-8} cm.) and can therefore no more act on light waves, which are large in comparison, than a leaf can influence the waves on which it floats. The wave lengths, fortunately, of the X-rays (10^{8-} to -0^{9-} cm.) correspond more nearly to such fineness."

Lattice Structure Best Represents Relative Position

The lattice structure represents the best scheme that we have for thinking of the relative position of the nuclei of quartz. One can gain the best analogy to this spacial relation of leptons by looking the other way at the stars overhead, where we find an immense system of spacially related bodies, not only at fixed distances apart, but each with its satellites revolving around the given star. Similarly, in a microcosmic field the atoms support each other at regular intervals. Science has not yet stamped these distances as final and exact in measurement, although a persistent hunt has cornered the atom to a ten-millionth of a millimeter, and we know just about where to find it in the wonderful beauty of any crystal of quartz.



Geometric shapes of quartz crystals—Left, the true alpha (α) form; center, the alpha-beta form, and right, the true beta (β) form

Crystal Growth Along Geometric Lines

The process of growth that any lively crystal demonstrates is in itself entertaining. We are accustomed to organic growth, but inorganic growth always seems somehow out of place unless we grasp the meaning of the bundles of electric energy which make up matter. A growing crystal is a remarkable exhibit of this force. Unfortunately, the conditions under which quartz crystals are formed are so rare that we can duplicate them only after much difficulty. Sugar in water on a shallow dish, or a pan of rapidly evaporating brine, will show more easily the results of the atoms struggling to find for themselves a new equilibrium, and as a result they grow under the eye from tiny nuclei into visible crystals.

Crystallization is evidently the addition of one layer after another of parallel particles built up on the initial nuclei. As the original bundles of energy are essentially geometric in space relation, the lines of addition are essentially geometric-producing, faceted bodies, rather than spheres and balls. The exact explanation of these phenomena leads us into a study of the velocities of atomic growth on the several planes and edges of the crystal. One who wishes to follow this phase of the subject further will find help from the work of F. Beck, A. Johnson, R. Gross and others. There is underlying common sense behind the conception. If one should conceive of a dinner plate, for instance, adding to itself in an

atmosphere that disturbed its original equilibrium, obviously the additions on the edge would reach further in the same time than additions on the top and bottom. If instead of a dull dinner plate one has a many-sided lattice work, it is easy to understand the reason for the innumerable crystalline designs of infinite variety that the crystal world enjoys. Snow on the window will bring this intricate fact home in a very simple way.

Changes in Crystal Shape

As research increases, the characteristic forms of crystals become better known. As a matter of fact, we begin again to take the final forms for granted, making the common mistake of passing by the question of why they assume exactly the shape they do. Study of this phase would lead too far afield. We pause, however, on one of the most interesting characteristics of quartz crystals. A crystal that has assumed a definite shape will change its leptonic arrangement without a catastrophy to the whole structure. At 575 deg. C. the arrangement of the leptons shifts from a ternary system to a senary system, or, expressing it crystallographically, from a trigonal crystalline system into an hexagonal system. If the temperature again falls below 575 deg. C. the leptons slide back again into their former formation. The photographic proof of these changes is part of the beautiful work of the Laue diagrams (page 71, "Crystals and the Fine Structure of Matter," Rinne). There seems to be general agreement in the explanation that this actual change in structure must be the result of a gradually developed tension in the structure of the crystal itself, which increases up to a critical point when there is a sudden change. Rinne lapses into dramatics when he conceives of the dance of the whirling lepton, who at a given signal from the band leader, faces right about. The metaphor is, however, a pretty figure.*

The diagrammatic picture of this shift of the oxygen and silicon particles in the silicon-oxygen triangle

$$Si<^{O}_{O}$$

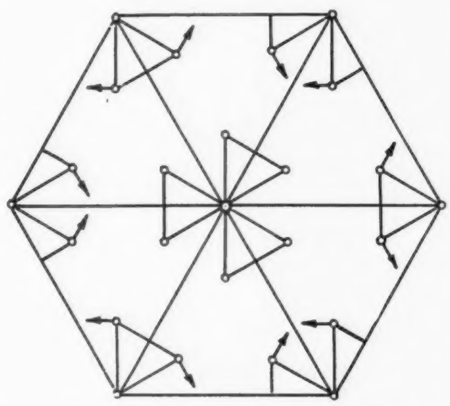
is schematically shown by the theoretical lattice.

To quote Rinne, page 168, "The arrows in the diagram of the screw trigyic (α) structure indicate the tendency of the (O) oxygen particles in the

$$Si<^{O}_{O}$$

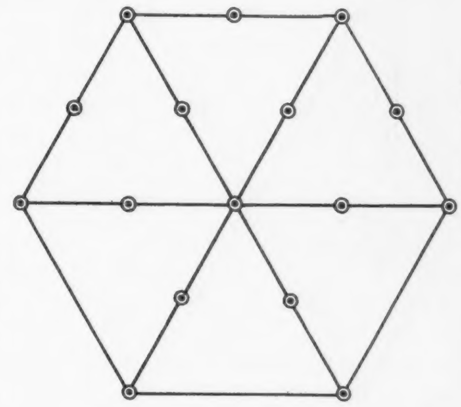
triangle to set themselves in screw arrangement, a tendency which steadily becomes more effective as the temperature rises; finally, the sudden rupture of the tension which has increased to the limit gives the β form." This explanation makes certain odd shapes of quartz crystals more easily understood. We can conceive of a true alpha (α) form that conforms on both ends of the crystal to the trigonal system, and we can readily recognize the true hexagonal forms, beta (β), which are common in nature. The very rare alpha-beta form does occasionally occur.

Just what conspiracy of circumstances produced an odd-ended crystal of the alpha-beta type is hard to visualize. A radical difference of degree of temperature at the time such crystals are formed can only account for that form. Two solutions are offered to satisfy the freak formation, either a great and sudden change of temperature at time of crystallization over a relatively short period of time, or else crystallization took place over a very long period of time at an excessively slow rate so that initial heat dropped under 575 deg. C. We can only rest the case on reasonable deductions as eye witnesses are few. The phenomena of twinning somewhat helps our thought. Twins usually spring simultaneously from a divided cell. Similarly in crystals when this form occurs, and it is not very rare, the two individuals apparently grow from a common base. Specimens of quartz that show this twinning characteristic frequently show one individual emerging from the side of another crystal and not from the base. Conditions at time of crystallization may account for such abnormalities, conditions that are off the map of intelligent guessing.



Three-sided or trigonal quartz (α form)

There is no end to trails that lead out of a crystal of pure quartz. But this paper must end so cast the last glance at the surface of a fine crystal as it appears under the power of a microscope (see Frontispiece). The triangular pock-marks are almost visible to the naked eye. A glass brings them into sharper relief. Their outlines can be very much intensified by submitting the specimen to a bath of hydrofluoric acid (H_2F_2).* Leybolt was the first one to observe that the indentation on the several faces of the pyramid were different. Three faces, when corroded, gave intensified lines or striae. These are just visible to the naked eye. The other faces developed triangular figures of corrosion, for the most part equilateral triangles. Des Cloiseaux improved on the experiments and reduced the striae to tiny isosoles triangles, similar to those observed on a natural crystal.



Six-sided or hexagonal quartz (β form)

George Friedel† reconciled this difficulty by noting that above 600 deg. the triangles were developed under corrosion of hot alkali whereas under 600 deg. C. (probably 575 deg. C.) the striae appeared on three faces. This phenomena ties in with what we found to be the critical temperature for the alpha-beta leptonic arrangement. The full explanation of the surface signs must lie deeply imbedded in the secrets of the fine structure of this fascinating diadem, a quartz crystal.

*See the refractive indices as developed by R. Kolb, illustrated on pages 166-167, "Fine Structure of Matter." Also F. E. Wright had similar results. W. H. & W. L. Bragg discuss the schematic structure of quartz in "X-rays and Crystal Structure," pp. 259 to 266.

*Le Chatelier discusses these characteristics at great length (Chap. 4, "La Silice et les Silicates," pp. 118 to 121). Further reference can be found in the work of Leybolt, 1855, *Ac. des Sc. de Vienne*, XV, 59-80, and Daniel, *J. of Sc. Arts publication de la Royal Inst. extrait dans les Annales de Physique et de Chimie*, II, 1 (1816). Much work has been done since then by Molengraaf, Des Cloiseaux, Gaubert.

†Friedel, *Bul. de le Soc. de Mineralogie*, XXV, 112 (1902).

Colored Earths of Italy

THERE ARE various deposits of colored earths in Italy, and nearly all are argillaceous in nature; they are colored more or less intensely with iron oxide such as the ocher, the sienna, green earth, etc. The total production amounted to 75,130 quintals in 1913, but since the war the average has been about 100,000 quintals. The present production is estimated at 130,000 to 150,000 quintals. This is produced mostly in Venetia and Sardinia; then follow Piedmont, which had a notable output in 1919-20, but which has decreased since; Tuscany, which at one time was an important producer; and Lazio, Umbria, and Trentinl.

About ten large firms manufacture gray earths in about fifteen plants situated in the provinces of Verona, Sienna, Grosseto, Livorno, Genoa, Trieste, etc. The domestic consumption of these earths has increased, while the exports have decreased.

Falls Creek Sand and Stone Co. silica plant, Falls Creek, Penn. The gallery connects the "green" sand and washed sand buildings

Silica Sand Plant in Northwestern Pennsylvania

Plant of the Falls Creek Sand and Stone Co. Produces 1100 Tons of Washed and Green Silica Sand Daily

ONE of the interesting silica sand plants of the Northwest Pennsylvania district is that of the Falls Creek Sand and Stone Co., of Falls Creek, Penn. This company produces both washed and green silica, the operation for each being separate and carried on in separate buildings in the plant. While the plant is not new, it is kept up to date, and the equipment is satisfactorily laid out for a good production. The output now runs more than 200,000 tons annually. The town of Falls Creek is adjacent to the much larger city of Du Bois, which thus supplies an additional market beside what is shipped out.

Silica Quarry

As in most of the other silica operations in Pennsylvania, the material is quarried from the sandstone rock, instead of being removed hydraulically as is done in the Ottawa, Ill., district. The material is a firm rock, and not disintegrated, so that blasting is necessary. A Sanderson-Cyclone well drill is used for drilling. Two Marion steam shovels with 2½-yd. buckets load the Western side-dump cars which take the material to the plant. The quarry is in a ridge or ledge of silica rock so that the face stretches for fully a half mile or more in a fairly straight line instead of being circular. No stripping is necessary. The quarry track passes along at the foot of the face and is connected near the ends by tracks leading to the plant. These come together and pass over a bridge over the water supply pond beside the plant. The track is standard gage.

Part of the sandstone quarry worked by the Falls Creek Sand and Stone Co.

Drilling in the quarry is done to a depth of 4 ft. below the level of the quarry floor. The holes are spaced 12 ft. apart and are in three rows. Between 70 and 100 holes are shot at one time.

The dump cars, each of which hold 6 yd., are hauled in trains to the crusher building by a Cook steam locomotive. The cars are then dumped to a steel-lined feeder hopper over an Allis-Chalmers jaw crusher which does the primary crushing. This discharge of the crusher falls to a large bucket elevator which carries it to the top of the plant and delivers it to a bar-grizzly. The elevator is driven by a Westinghouse motor equipped with a solenoid brake.

The grizzly allows minus 2-in. material to pass through, and this material is chuted to a conveyor belt and taken out of the crusher building and over an inclosed bridge to the top of the building used for preparing the washed product. A Westinghouse motor drives the conveyor.

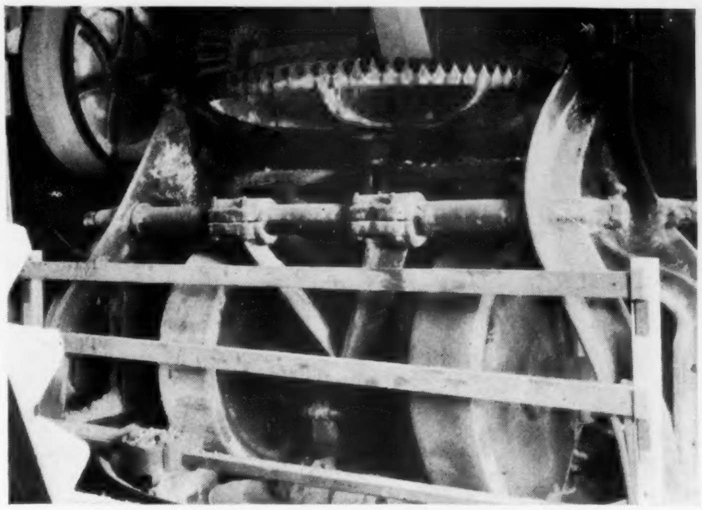
Crushing and Screening

The belt conveyor delivers the material equally to two bins in the washing building. Below each bin there is a Stevenson chaser mill which receives its material directly from the bin. The chaser mills grind the material to a fineness suitable for the revolving screens and then pass it on to these

screens. There are two of these screens for each chaser mill, and they are 42 in. by $8\frac{1}{2}$ ft. in size. These screens deliver their material to the revolving screw washers below. It is also possible to by-pass the revolving screens entirely and send the material directly from the grinding mills to the screw washers. This arrangement permits the production of either fine or coarse sand as desired.

Washing

There are two batteries of six screw washers each. Each of the four revolving screens delivers sand to three of these washers. These units effectually clean the sand and then drop it on to the belt which carries it to the storage bins. The revolving screens and the screw washers are run from a Westinghouse 20-hp. motor. They were all made by the Lewistown Foundry and Machine Co. of Lewistown, Penn.



Drive mechanism on one of the chaser mills

The overflow from the washers is carried in a wooden flume to the end of the building and delivered to a large reclaimer tank. This has been found profitable, as it catches considerable good sand which would otherwise be lost. This unit delivers the reclaimed sand to a pair of sand screws which carry it up to the same belt which receives the sand from the other screw washers.

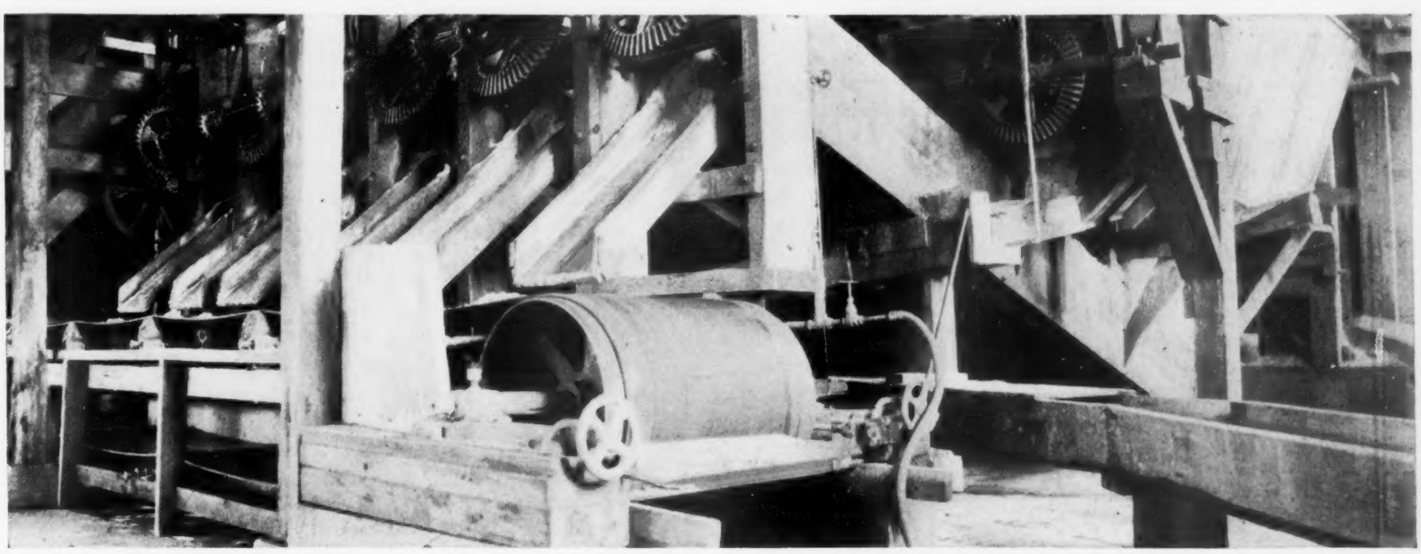
The finished product is carried up to a pair of bins outside of the washing plant. Here the belt discharge can be sent to either of the bins as desired, depending on whether fine or coarse sand is passing through the washers. There is also an arrangement at the head of the belt conveyor which permits passing the material over the two bins entirely and carrying it out to a stockpile by means of a chute. This chute has been glass-lined to counteract the abrasive quality of the sand, and to cut down friction as much as possible, since the slope of the chute is necessarily flat in order to reach the stockpile. The belt from the washers to the bins is driven by a 15-hp. Westinghouse electric motor.

Returning to the crushing building, where the separation of material for the washing plant and the green mill is made, we can follow the unwashed material through the green sand section of the operation. The 2-in. grizzly, which separates the fine material and sends it to the washing building, passes the larger material down to a Buchanan secondary jaw crusher at the first floor of the crusher building. This crusher is driven by a 75-hp. motor. The discharge passes to a conveyor which carries it to the

Overflow from the screw washers is sent to this drag classifier for recovery of sand content

green sand building, passing beneath the railroad tracks which are between the buildings.

In the green mill, the belt from the crusher building discharges to the foot of a bucket elevator which carries the sand to the top of the building and delivers it to hoppers above two chaser mills, one being a Stevenson and the other an American. The material passes through the chaser mills and the discharge of each mill is again taken up to the top of the plant by its own bucket elevator. The material from the two elevators combine at the top of the plant and are delivered to a Mitchell vibrating screen. The



Sand discharging from the screw washers to the conveyor belt running to the storage bins

material passing through the screen drops to bins for loading to cars, while the rejects fall to a return belt and are carried back to the crusher building for regrinding, thus completing the closed circuit.

There are two Ingersoll-Rand air compressors at the Falls Creek plant used for supplying air to the quarry and for the air hoist in the crusher house. A third compressor made by Fairbanks, Morse & Co. is held in reserve. All these compressors are operated by electric motors. Water is supplied from a small pond beside the plant which was formed by damming the little creek which flows between the quarry and the plant. A Triplex plunger pump driven by a Westinghouse motor is used.

There is a transformer station beside the plant to which the purchased power comes at 2200 volts. Here it is stepped down to 220 volts for use in the plant.

The material is shipped out from the plant practically entirely by rail. The tracks run beside the washed sand and green sand bins and chutes load to the cars. To the north and east of the plant a considerable area has been taken up for stockpiling and here a Marion dragline crane with 1½-yd. bucket is used for reclaiming the stocked material.

The plant produces fine washed sand for general purposes, coarse washed sand for friction sand, and unwashed molding sand. Shipping is over the Buffalo, Rochester, and Pittsburgh railroad, and the Pennsylvania railroad. The capacity of the plant is more than 1100 tons of sand daily, and the monthly run is about 21,000 tons.

Wash water pond formed by damming the creek—Falls Creek Sand and Stone Co.

Energy Used in Crushing

THE STUDY of the relationship of work to size in crushing has resolved itself into a study of the surface exposed in crushing. The dissolution method (measuring the surface by weighing the amount dissolved off under standardized conditions) has been successfully used by Martin and others and divested of chances of error by John Gross and S. R. Zimmerley, metallurgist and assistant of the Intermountain Experimental Station of the United States Bureau of Mines. These authors in a previous paper, Technical Publication No. 46, of the American Institute of Mining and Metallurgical Engineers, described their dissolution method. In Technical Publications No. 126 and 127 of the institute they apply the method to a study of the surface exposed in crushing and to investigating the relation of the work expended to the surface exposed.

Both papers are highly important to the designers and users of crushing machinery. In paper No. 126 it is shown that much effort is expended in making cracks which may not be very deep but which are enough to greatly increase the exposed surface and which take work in proportion. The amount of surface in cracks varies with the size of the particle, being greater in the larger pieces. A table which gives the area of exposed surface in a crushed product from ¾-in. to 200- to 270-mesh shows that for ¾-in. pieces the surface is 8.55 times the theoretical; for 8- to 10-mesh it is 5.28 times; for 28- to 35-mesh it is 3.11 times, and for 200- to 270-mesh it is only 2.02 times. The theoretical surface, of course, is what the surface would be for a smooth regular solid. Ottawa sand, which is of regularly shaped grains that contain few cracks, was found by the authors to have a measured surface nearly equal to the theoretical, as 1:1.35, about.

Measuring Crushed Surfaces

The authors say that it is easy to believe that as the grains become smaller they become more regular in shape. They have carried out their logarithmic plotting to the ultimate in crushing which they hold to be a unit crystal of quartz, a quartz triplet. Such crystals would have a surface area of 65,500,000 sq. cm. per gram. The correspondence of the experimental curve with the theoretical calculated curve is taken as evidence of the accuracy of the method of measuring surfaces.

The dissolution method was applied to a study of minus 200-mesh material and to determine the diameter of the particles that composed it. The highest and lowest average values for surfaces per gram obtained were 7055 sq. cm. and 2043 sq. cm., corresponding to diameters of 18 microns and 5 microns. This is much less than the 37 microns which has generally been assumed for the average diameter of minus 200-mesh and it helps to explain why so much power is needed to produce minus 200-mesh material.

The significance of this is more clearly brought out in Technical Publication No. 127 when the relation of work input to surface is considered. The first part of the paper is given to a discussion of the experimental crusher used and the method of using it. Both were about as simple as possible, the machine being a plunger in a cylinder which was struck by a ball dropped from a measured height.

A study of the results obtained brings out some interesting facts such as that the percentage of work input actually used in crushing varied from 58.1% on 65- to 100-mesh to 91.4% on 10- to 14-mesh. Other tests on the 10- to 14-mesh size with a high drop showed that only 62% of the work input was used. The authors do not mention these things in their discussion, but it would seem that they might form the basis for further investigation.

But whether the device was efficiently run or not there was a close correspondence in the area of surface exposed for every unit of work that was expended in actual crushing. The results varied from 16.1 to 19.0 sq. cm. per kg./cm.^{2}, the average being 17.56 sq. cm. (This is equivalent to about 38 sq. in. of new surface for each foot pound of energy actually used in crushing.—The Editor.)

With this experimental device as with other crushers a great deal of the work went to making fines. To show this the authors give the example of the crushing of 20- to 28-mesh material. This must have been slightly crushed, for 43% still remained on 28-mesh. But there was 4% of minus 200-mesh produced and this 4% represented 73% of the power used.

The absolute efficiency of crushing is known to be low, but these authors, by determining the area of exposed surface at 17.56 sq. cm. per kg./cm.^{2}, have shown it to be higher than previous investigators have found it to be. Thus Martin could ascribe only 1/16 of 1% efficiency to his ball mill and Gaudin found only 1.3% of the energy used by rolls to be represented by fresh surfaces. The authors find the absolute efficiency to be 3%, figured on Edser's value of 920 ergs per sq. cm. for the surface energy of quartz. They conclude that there is a great loss in energy dissipated as heat. If this could have been measured it would have been possible to determine the efficiency of crushing exactly, but it was not feasible to make such measurement.

Fundamentals of Shaft Lime Kilns

A Discussion of V. J. Azbe's Paper on the "Ultimos" Kiln Published in Rock Products, June 12, 1926

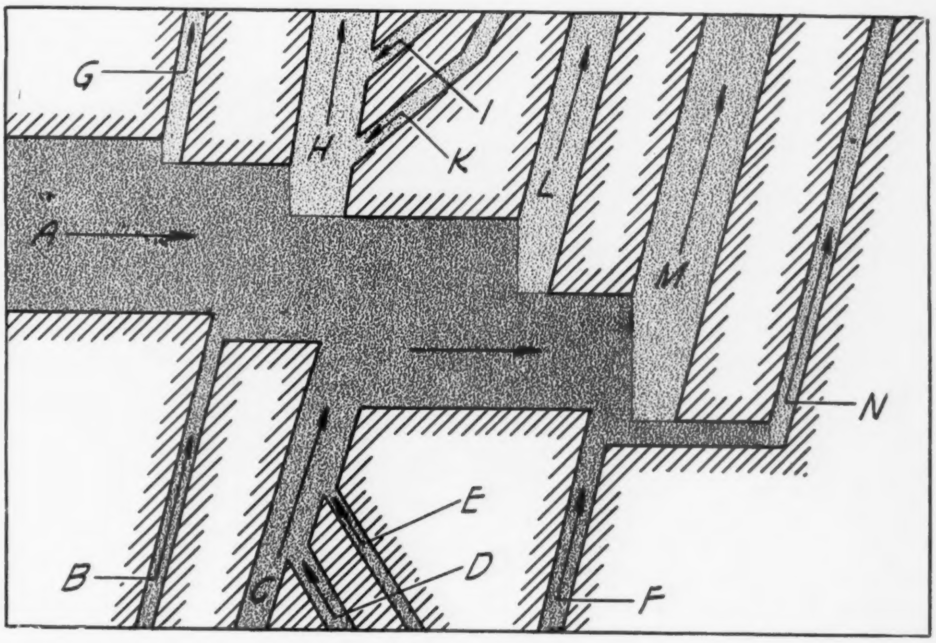
By Otto K. Schaefer
Consulting Engineer, Niederscheld, Germany

CONSIDERING the important place which lime now occupies among manufactured products, every attempt in the direction of improvement of the burning process or of further economy in lime manufacture should be welcomed and carefully checked as to its practical value. The most recent efforts towards this end have been contributed by V. J. Azbe, consulting engineer, St. Louis, Mo. At the 1926 convention of the National Lime Association, Mr. Azbe's paper, "Heat Distribution in Lime Burning and Evolution of 'Ultimos' Kiln," attracted considerable attention. This paper was published in full in ROCK PRODUCTS, June 12, 1926. An abstract of this appeared in Vol. No. 53, 1926, of the German periodical, "Die Warme," and based on the data therein, the author has coordinated his own work so that a comparison can be made.

The extensive investigations carried out by Mr. Azbe are unfortunately unknown to the author; the conclusions drawn by him, however, cannot be directly transferred to German conditions nor be made the basis of general deductions for the German lime industry. Mr. Azbe has either allowed some error to creep in in his investigations or, as the former is rather improbable, the best German lime kilns are apparently considerably ahead of American kilns such as studied in Mr. Azbe's investigations. This point will be discussed in the following.

The ideal kiln designed and proposed by Mr. Azbe is a shaft kiln fired with producer gas. The author, therefore, compares it to German gas fired shaft kilns, such as have been in operation in Germany for several years, yielding not only favorable fuel utilization but also maximum outputs per sq. m. of kiln cross section.

The data given by the author are taken from extensive and recognized sources and were obtained by competent investigators on shaft lime kilns of the Muller type using producer gas (from lignite and coke breeze) or illuminating gas (coke oven gas). These kilns were located at the Lahn and in the Rhineland. Their operation was partly automatic. Their cross section in the burning zone was about 8 sq. m. (86 sq. ft.) and their output during normal conditions of operation was 50 to 60 metric tons per kiln per day of perfectly burned, large lump lime, the fuel efficiency being 65 to 70%.



Heat circulation in a gas-fired shaft lime kiln of the Muller type during normal normal and continuous operation

The heat balance of these gas fired kilns, worked out following Mr. Azbe's outline, is given below:

*Translated by M. A. Corbin, Chicago Heights, Illinois.

TABLE I. HEAT INPUT

a.	Heat carried by the gas from the producer	100.0%
b.	Heat due to higher temperatures produced by preheated air	12.5
c.	Heat due to preheating the limestone to 900 deg. C. by flue gases	27.4
d.	Heat due to preheating the limestone by carbon dioxide of lime	18.8
e.	Heat due to preheating the limestone by 40% excess air	10.2
f.	Heat due to preheating of air by lime in cooler	23.1
	Total heat input	192.0%

TABLE II. HEAT OUTPUT AND LOSSES

g.	Heat losses in the gas producer	16.0%
h.	Heating of the rock to 1000 deg. C.	39.7
i.	Heating of the lime from 1000 deg. C. to 1200 deg. C.	4.5
k.	Heating of the carbon dioxide from 1000 deg. C. to 1200 deg. C.	4.3
l.	Heating of the air of combustion from 10 deg. C. to 1200 deg. C.	45.5
m.	Heat for decarbonation of lime	68.0
n.	Total losses (due to incomplete combustion, heat retained by flue gases, losses through conduction and radiation)	14.0
	Total heat output	192.0%

TABLE I. HEAT INPUT (PER 10-TON LIME)

		Kg. cal.	B.t.u.
a.	Heat carried by the gas from the producer	11,250,000	45,000,000
b.	Heat due to higher temperatures produced by preheated air	1,407,180	5,629,120
c.	Heat due to preheating of limestone to 900 deg. C. by flue gases	3,067,140	12,268,360
d.	Heat due to preheating of limestone by CO_2 of lime	2,118,480	8,453,920
e.	Heat due to preheating of limestone by 40% excess air	1,140,720	4,562,880
f.	Heat due to preheating of air by lime in cooler	2,596,000	10,384,000
	Total	21,579,520	86,318,080

TABLE II. HEAT OUTPUT AND LOSSES (PER 10-TON LIME)

		Kg. cal.	B.t.u.
g.	Heat losses in the gas producer	1,800,000	7,200,000
h.	Heating of the limestone to 1000 deg. C.	4,455,000	17,820,000
i.	Heating of the lime from 1000 deg. C. to 1200 deg. C.	510,000	2,040,000
k.	Heating of the carbon dioxide from 1000 deg. C. to 1200 deg. C.	481,600	1,726,400
l.	Heating of air of combustion from 10 deg. C. to 1200 deg. C.	5,107,920	20,431,680
m.	Decarbonation of the lime	7,650,000	30,600,000
n.	Total heat losses (due to incomplete calcination, heat retained by the flue gases, conduction and radiation losses)	1,575,000	6,300,000
	Total	21,579,520	86,318,080

Note: 1 Kg. cal. = 1 Warmeeinheit (W.E.), equivalent to about 4 B.t.u.

These percentages were obtained during continuous operation per 10 tons of lime, the actual heat expenditure being given in Table II.

The average temperature in the burning zone was determined as 1200 deg. C., while the maximum temperatures reached 1450 deg. C. The temperature of the flue gases leaving the kiln averaged 230 deg. C.

In starting a gas fired shaft lime kiln all of the 192% heat is carried to the kiln from the outside. As soon as continuous operation is established, a considerable part of the heat circulates in a continuous cycle inside the kiln. This heat cycle represents a saving of about 92% of the heat originally supplied to the kiln, so that the remaining 100% continually supplied to the kiln covers the heat required for the reduction of lime as well as all heat losses. As shown by the heat balance, the heat cycle inside the kiln goes on with some losses so that about 2% of the continually supplied heat is expended in covering this loss.

While Mr. Azbe assumes 67% heat losses and only 33% useful heat as average values of a lime kiln under average operating conditions, on which his figures are based, the carefully investigated shaft lime kilns mentioned above yield a heat utilization of about 70%, including the losses in the gas producer, and basing the percentage on the quantity of fuel supplied to the producer, with a heat loss of about 30%.

Radiation Losses

Apparently through an error Mr. Azbe introduces radiation losses three times, itemizing them as general losses and losses in the burning and preheating zones. As the burning and preheating zones are without doubt intrinsic parts of the kiln itself, the radiation of the kiln must include the radiation of all sections.

Such low heat utilization, as established by Mr. Azbe for average American kilns operating under average conditions (33%), is encountered in Germany only in old, defective or poorly operated kilns with mixed firing, generally not effectively sealed at top and bottom and having no special regulation.

According to recent extensive investigations of Schack (Dr. Ing. Schack), published in "Archiv fur Warmewirtschaft," the maximum practically obtainable efficiency of shaft lime kilns without special waste heat utilization cannot exceed 70%. This assumed, however, a temperature of the flue gases of about 400 to 500 deg. C., i.e., a relatively high one. Since the flue gases of the kilns discussed here operated under most economical temperatures of about 120 deg. C. before and 340 deg. C. after leaving the kiln, the heat of these gases is used up within the kiln to a maximum extent. A further practical and effective utilization of the remaining waste heat is difficult, as only a small recovery is possible.

The generation of steam with the waste heat of lime kilns has been urged and tried (the first tests took place over 50 years ago); but, to the author's knowledge, has received no practical application. The generation of steam by the waste gases of an economically operated lime kiln would not be satisfactory on account of the low heat recovery possible, and, with certain exceptions, would hardly suffice to justify the cost of the installation.

The preheating of the air supply is practiced not only in the kilns discussed here, but is a general condition of successful operation throughout Germany.

Ideal Temperatures

Mr. Azbe's statements concerning ideal temperatures in the burning zone and, particularly concerning the "excess heat" in the top part of the burning zone, are not clear. It is to be assumed that the ideal temperature of 1370 deg. C. represents the average maximum temperature of the burning zone. Statements regarding the "excess heat" which may be recovered from the upper part of the burning zone are contradictory to practical evidence obtained in most economically operated kilns. The temperature of the effective heat of a lime kiln is generally considered to be just above the decomposition temperature of the limestone (about 900 deg. C.), for the carbon dioxide can only be driven off above 900 deg. C. The higher the heat, the more rapidly decarbonation occurs, and the output is increased correspondingly. However, conduction and radiation losses are also increased. The author fails to see from what source the excess heat in the top part of the burning zone should come, as the entire heat above 900 deg. C. is used up in the decarbonation of the limestone. If, as recommended by Mr. Azbe, considerable quantities of heat should be taken from the kiln at a height of about 3.65 m. (12 ft. 2 in.), or, judging from the sketches, from the upper line of the gas inlets upward, they would be not only direct losses as far as the burning process is concerned, but the entire kiln operation, which is familiarly divided into preheating, burning and cooling, would be disrupted, which would mean even a greater disadvantage. Thorough and uniform preheating of the charge would be made impossible. This would result in a decrease of the efficiency of the kiln even under the most favorable circumstances. The capacity would be reduced accordingly. It is most probable that withdrawal of heat from the upper part of the decomposition zone would in most cases make regular and economical operation impossible. It seems to be an unquestionable truth that the most rational way of utilizing the heat, including that of the flue gases, is in the kiln itself. All attempts should, therefore, be directed toward this end and all possibilities should be studied and exhausted of further utilization of the heat and corresponding increase in efficiency of the kiln before any other heat utilization is considered. The use of heat for the generation of steam, as suggested by Mr. Azbe, has no advantages and on the contrary is harmful to the calcination process.

Increased height of the stack alone will not reduce the flue gas losses, as it is of no importance whether the heat losses take place in the stack or upon leaving it. The flue gas losses of a lime kiln can be regulated and cut down by more frequent charging and drawing, by extending the preheating zone, and by reducing the quantity of fuel. Increasing the length of the stack without decreasing the cross section area results in increased draft. The flue gas temperatures necessary for operation are lowered so that actually the heat loss is less if the flue gases leave the stack at these lower temperatures.

Reactions in the Kiln

The shaft kilns investigated by Mr. Azbe are apparently kilns with direct firing with coal as fuel, i.e., kilns with so-called mixed firing. It is very probable that in these kilns a chemical reaction previously discussed by the author takes place; the carbon of the coal fuel and the carbon dioxide of the limestone reacting to form carbon monoxide and through which appreciable heat is liberated by the carbon dioxide. This reaction is not limited to the kiln with mixed firing and can take place wherever carbon comes in contact with the carbon dioxide of the limestone at suitable temperatures as in kilns fired by pulverized coal or oil. This reaction will be discussed in detail below. Tests and investigations have not as yet succeeded in establishing the extent of this reaction or the conditions influencing it. The chemical reaction of carbon dioxide with carbon has been known for some time as a typical reaction taking place during gas generation in the gas producer. The reactions in a kiln with mixed firing are in some respects identical with those in the gas producer. In the producer the carbon dioxide is formed through the combustion of the fuel, then is reduced to carbon monoxide by passage through the glowing fuel bed. The heat generated during combustion is used up to complete this reaction. The procedure is somewhat different for lime burning, for the carbon dioxide is present from the start, it being driven off from the limestone. The equations below are based on 1000 molecular quantities.

The thermal equation for the gas producer reaction is as follows:

$C + CO_2 = 2CO - 38{,}800$ kg. cal. (151,200 B.t.u.)

This equation is derived as follows:

$C + O_2 = CO_2 + 97{,}200$ kg. cal. (388,800 B.t.u.) and $2C + O_2 = 2CO + 58{,}400$ kg. cal. (233,600 B.t.u.)

During the reaction in the lime kiln a quantity of carbon, proportional to the quantity of carbon entering the reaction, is recovered This carbon is present as carbon dioxide before the reaction takes place and is changed through it to carbon monoxide. This not only utilizes the heat liberated dur-

ing conversion of carbon to carbon dioxide but reduces the amount of air required for combustion due to the oxygen set free in this reaction. An added advantage is the fact that this oxygen is present immediately in contact with both fuel and lime, i.e., also in the burning zone where for many reasons only a relatively small amount of air comes in contact with the coke or other fuel. This results in a better and more uniform burning, reduces the pressure of carbon dioxide and hastens decomposition.

In other words, far less heat is required to produce CO in the lime kiln than in the gas producer. This is evident, for all the heat otherwise necessary to produce CO_2 as saved for the CO_2 is already present, so the entire heat derived from the fuel can go to breaking up the CO_2. The thermal equation in the kiln becomes:

$$C + CO_2 = 2CO + 19{,}600 \text{ kg. cal.}$$

Since we are dealing in kilo-molecular quantities, to calculate the surplus heat of 1 kg. of carbon (C) it is only necessary to divide 19,600 by 12 (the molecular weight of carbon). This done, gives 1633 kg. cal. The heat consumed by the reaction computed on the same basis is 38,800 kg. cal. $\div$ 12 = 3233 kg. cal. per kg. of carbon. The reaction

$C + CO_2 = CO$ expressed in kg. becomes 1 kg. C + 3.667 kg. CO_2 = 4.667 kg. CO

4.667 kg. CO burns to produce 7.334 kg. CO_2 with the liberation of 11,360 kg. cal. of heat (4.667x2434).

Including the heat lost to break down the CO_2, the total heat evolved in kg. cal. is:

$$1633 + 3233 + 11{,}360 = 16{,}226 \quad [1].$$

The total heat evolved in the direct burning of 2 kg. of carbon to 7.334 kg. of CO_2 is calculated as follows:

$$2 \times 8100 = 16{,}200 \text{ kg. cal. } [2].$$

The two values [1] and [2] check fairly well, the difference being due to the usual rounding off of figures for the theoretical heat value (the heat value of 1 kg. of C being 8080 instead of 8100 as used in the calculations). All these values are of conditional accuracy, however, for they vary with temperature changes.

The reduction of carbon dioxide is limited to certain temperatures. It begins at about 900 deg. C. (this is also the temperature at which the decarbonation of limestone begins) and is considerably accelerated by higher temperatures, so that it takes place almost instantaneously at 1300 deg. C.

The useful heat derived from the carbon of the carbon dioxide is: 16,200 — (8100 + 3233) = 4867 kg. cal. These 4867 kg. cal. correspond to a quantity of 0.6 kg. of carbon; so that for each kg. C entering the reaction, 1.6 kg. C. = 160% are burned. The useful heat thus derived is considerable when larger quantities of carbon enter this reaction. It would be desirable to make investigations to determine the extent of this reaction and the factors influencing it in addition to the above.

Before the latter are cleared up, the author considers it impossible to establish even an approximate heat balance of kilns, in which a reduction of the carbon dioxide of the lime by the carbon of the fuel may take place. For the same reason the author ascribes only a limited value to Mr. Azbe's deductions on the heat expenditure of coal fired shaft lime kilns.

Comments on Otto K. Schaefer's Article

By Victor J. Azbe

OTTO K. SCHAEFER in his article, "Fundamentals of Ideal Shaft Lime Kilns," exaggerates when he terms it a "comprehensive criticism" of my paper on the "Ultimos," published in ROCK PRODUCTS of June 12, 1926. Mr. Schaefer either is not entirely familiar with the problem, or the German translation of my article upon which he bases his conclusions was poor, or both.

Mr. Schaefer's article is so full of faults that one hardly knows where to begin the criticism and even where the subject has sense, it is only disconnectedly related to my article. The fact that the title of my article was "A Hypothetical Lime Kiln" and the meaning of this title have apparently enparently entirely escaped his perception. He also, as he admits, failed to familiarize himself with my previous writings on the subject. If he had studied that entitled "Theory and Practice of Lime Manufacture" his grounding in the subject would have been such that he would have appreciated the motives of the "Ultimos" article.

I never hesitate to acknowledge my mistakes. One is bound to make them when path-breaking in what is, to a great extent, an unexplored field. There are, however, no mistakes to be acknowledged in connection with "Ultimos" and same was checked by men higher in professional standing than Mr. Schaefer enjoys in Germany and this without development of any necessary corrections.

Mr. Schaefer's own article, on the other hand, is full of faults. The tabulations of heat input and heat output are entirely wrong, wrong to such an extent in fact that they are difficult of checking.

As to German gas kilns, especially those on the Lahn mentioned by Mr. Schaefer, they were visited by me and were described in ROCK PRODUCTS. While their performance was good, it was not so very extremely remarkable. We now have gas kilns in this country fully as good and even better. While unforunately it is true that many an American kiln has an efficiency of 33%, it is also true that no German lime kiln has an efficiency of 70% as Mr. Schaefer claims, particularly not gas kilns. Mr. Schaefer should read statements of their own Dr. Urbach and of Mr. Seeger of the German Lime Association, published in ROCK PRODUCTS in my recent series, covering this point.

Mr. Schaefer's criticism of my method of distributing radiation losses reveal again that he is not fully appreciative of the differences between heat of high, and heat of low elevation and of the fact that due to this the losses must be divided and cannot be grouped. Losses from the burning zone are very harmful, which is not true of those from the preheating zone, since there is in all kilns more heat available for preheating than is necessary; if that was not so, waste gas temperatures would be far lower than they are. An appreciation of this fundamentally important fact is necessary before one can be considered qualified to criticise any thermal problem of this nature.

Among other matters, Mr. Shaefer claims that generation of steam with waste heat has been urged and tried, but to his knowledge has not received practical application; in England, however, there are quite a number of kilns operating with waste-heat boilers.

As to waste-gas temperatures in the paragraph where he disagrees with Dr. Ing. Schack, it can safely be said such temperatures are not true temperatures. No kiln ever operated with an average temperature of 120 deg. C. over a normal working period of 24 hours. Determining kiln, waste-gas temperatures is not a simple matter and the operator must be one who does not hastily make up his mind and one who is fully equipped with proper instruments that are to be used properly, which in the case of lime kilns is not as simple as it sounds.

There is hardly a paragraph of Mr. Schaefer's article to which some objection could not be offered and I have not either the time or inclination to comment on all. Some of his statements, however, are sensible, but just have no connection with my article, and so could hardly be called criticisms.

Analysis of Fluorspar

IN CONNECTION with the standardization of the Bureau of Standards standard sample of fluorspar No. 79, old methods of analysis were tested and modified, and new methods were developed. Research Paper No. 51 sets forth the procedures found desirable for the determination of carbonates, silica, calcium fluoride, sulphur, barium, lead, and zinc.

Notes on Cement Mill Grinding Experience and Practice*

Simple Ways to Increase Grinding Efficiency

By Th. Trampe
Shanghai Portland Cement Works, Lunghwa, China

I HAVE READ of late a great deal in cement periodicals concerning improvements in the manufacture of portland cement, and of the increased outputs of the individual machines. For the operating employe it means today, the prescribed quantity shall and must be obtained, and at the same time the quality of the cement produced must not become inferior in its composition. No owner will permit retrogression in output and quality. In my practical activities I have learned to know the shortcomings as well as the good characteristics of the individual machines.

During the most recent period the manufacture of portland cement according to the wet or sludge process is the most frequently adopted system. The raw-state preparation, according to the wet process, in its manifold installations, has stone crushers with roller mills, ring-roll mills, hammer mills, Zet and Titan breakers, etc.; all these machines are for the purpose of sizing the raw material as fine as possible, for the finer the raw material comes to the finish mill, the more output can the mill attain. Under no circumstances should one permit, through a wrong adjustment of the individual machines, the material that goes to the mill to be too coarse.

Each machine manufacturer gives guaranteed outputs for his machines, of whatever type the breaker or the mill may be. For reasons of safety, all machines perhaps are made larger than actually needed, so that the guaranteed output can be obtained. But not every tube or compartment mill can handle its prescribed quantity, usually because of the composition of the raw materials. Hard limestone, marble, chalk; all these raw materials grind differently. Here it is necessary to undertake examination of the material.

Getting at the Efficiency of Various Machines

If a mill has been in operation for a long period, the normal output is determined by experience, and the degree of fineness to which it grinds must be noted down continually. In order to increase the output of the mill, the mill must be examined in respect to fineness attained in the individual compartments in regard to their grinding effect. This is done as follows: The mill is stopped when in full run, and, starting from the feed end, a screening sample is taken every one-half meter or 1½ ft. This process must be repeated several times, and after plotting these samples there results an exact milling diagram. From this diagram can be well seen, directly, the actual output of the individual compartments.

For example, a three-compartment mill, the mill produced, before examination, 280 tons; the degree of fineness was 10% residue on the 4900-mesh (metric) screen; power consumption was 380 amp. at 500 volts; the length of mill, 12 meters (39 ft.); diameter, 2 meters (6.6 ft.). Upon the basis of the milling diagram, the mill was refilled; the balls were in part replaced by larger ones, or smaller ones, and special grinding bodies were added to the mill. After that the output of the mill was 350 tons with a fineness of 7% residue on 4900-mesh; power consumption, 380 amp.

In another multi-compartment mill it was not possible to bring the second compartment up to a greater output with all fills which were tried; the increased capacity of the compartment, which was to be attained according to the capacity curve, was not reached. Then grinding cubes were placed in this compartment, and the compartment delivered the desired output. The improvements which were carried out upon the basis of these investigations resulted in an increase in output of 20% to 40%.

It is perhaps in the interest of every cement plant operator to plot maximum outputs from every mill. The small interruptions through refilling of the mills are overtaken by the increased outputs. It is perhaps a well-known fact that burning is better with fine raw material. The intensive mixing after the grinding must under no circumstances be omitted.

Increasing Kiln Efficiencies

Rotary kilns which operate on the wet process are perhaps the more often equipped with lifting devices or U-irons at the intake end, in order to utilize fully the hot gases. Here it is also possible to make the hot gases more serviceable to the combustion process. An experiment undertaken with old elevator chains fully confirmed this. The chains were suspended systematically in the first third of the kiln, starting at the intake end. The increased output of the kiln thereafter was 15% to 20% without an increase in coal consumption.* How far the chains should extend into the kiln is determined by the kiln itself; chains which hang too far into the sintering zone burn off; therefore it is better to make the chain zone too long than too short.

Only finely ground coal should be used for burning the clinker, for the better then are all the constituents of the coal broken up for burning. In our practice 20% to 25% coal consumption is required for producing clinker in rotary kilns. Rotary grate kilns, so-called independent shaft kilns, get away with 10% to 12%. That the outputs of a rotary grate kiln cannot keep up with the modern rotary kiln is due to the design of the rotary grate kilns. For even today 100 to 120 tons of clinker can be produced in these kilns. Old existing rotary grate kilns can be rebuilt without considerable costs according to the new system.

Clinker Grinding Suggestions

That the grinding of the clinker is today more difficult than formerly is due to the necessity for improvement in the quality of the cement. It is a fact that because of this quality requirement the old cement mills can hardly keep up. But here also the output must be studied and plotted. Experiments which have been carried out have shown that it is possible to obtain a greater output from the old mills. As an example of many: A cement compartment mill (two compartment system with screens on the outside); 2 meters (6.6 ft.) in diameter; 12 meters (39 ft.) long; power consumption, 380 amp., 500 volts; output, 1200 bbl.; degree of fineness, 14% on 4900-mesh (metric) screen. This mill was handled exactly the same as the raw material mill. The mill was stopped in full operation and a sample withdrawn every 1½ ft. This sample-taking was repeated several times in order to obtain average samples of the amount and size of the

*Written especially for ROCK PRODUCTS.

*The use of chains suspended in the feed end of kilns has been patented in many countries by F. L. Smidth and Co., New York City, and Copenhagen, Denmark.

material. Due to the improvement of the quality of the clinker, the mill had decreased to 1000-bbl. output. After refilling with grinding balls, change in the character and size of the grinding media, change of screens, tightening of the intermediate wall, tightening of the intermediate wall from compartment No. 1 to compartment No. 2, the output of the mill was increased to 1450 bbl.; the degree of fineness to 12% on the 4900-mesh (metric) screen, with a power consumption of 400 amp.

That every mill can perform to this output is, according to circumstances, impossible. The entire initial preparation, composition of the raw material, burn of the clinker, humidity, have such a great effect upon the grinding process of the mill that each mill must therefore be studied and examined at its location and place in respect to output, in order to obtain maximum outputs. Such improvements are perhaps possible in every cement plant; larger alteration should, however, so far as possible, be undertaken by specialist firms.

Evaluating Crushing Efficiency

A NEW METHOD of evaluating the efficiency of crushing and grinding machines is described by Will H. Coghill in one of the recent issues of *Engineering and Mining Journal*. It starts by considering the various mesh sizes of a screen analysis to be "forces" which are arranged on the arm of a lever hinged at some convenient point, as 4-mesh. The points for the mesh sizes are spaced at equal distances, as 1, 2, 3, 4 and these numbers multiplied by the percentage on each mesh give the "moments" for each mesh size.

Several important things in connection with a crushed product may be discovered by applying this method. A simple application is given in Diagram 1, where it is used to find the *mean mesh size* of a product, the mean mesh size being a weighted average of all the sizes.

Diagram 2 shows how it may be applied to show the effect of crushing. The example is taken from the work of a set of 18 x 42-in. rolls, crushing 3400 tons in 24 hr. and requiring 350 hp. The mean mesh size of the feed is found to be 6.15 and that of the product to be 11.11. The difference is 4.96

Mesh	Lever Arm	Per Cent Weight (Forces)	Moment
4			
6	1	2	2
8	2	8	16
10	3	15	15
14	4	25	100
		4.63	
20	5	20	100
28	6	15	90
35	7	10	70
48	8	5	40
		100	463

Position of mean mesh, or resultant,

Diagram 1. Illustrating the use of the force diagram to determine mesh

Table I

Mesh	Weight, Per Cent
— 4 + 6	2.0
— 6 + 8	8.0
— 8 + 10	15.0
— 10 + 14	25.0
— 14 + 20	20.0
— 20 + 28	15.0
— 28 + 35	10.0
— 35 + 48	5.0
	100.0

Mesh	Lever Arm	Feed: Weight, Per Cent	Feed: Moment	Discharge: Weight, Per Cent	Discharge: Momen
26.67 mm.	1	1.1	1.1		
18.85 mm	2	4.2	8.4		
13.33 mm.	3	17.0	51.0		
9.42 mm.	4	22.5	90.0		
3	5	14.2	71.0		
4	6	9.2	55.2	0.3	1.8
		6.15			
6	7	6.9	48.3	7.8	54.6
8	8	5.4	43.2	22.1	176.8
10	9	3.1	27.9	13.5	121.5
14	10	2.8	28.0	11.1	111.0
20	11	2.0	22.0	8.0	88.0
				11.11	
28	12	1.9	22.8	5.9	70.8
35	13	2.0	26.0	4.4	57.2
48	14	2.0	28.0	4.0	56.0
65	15	1.3	19.5	3.0	45.0
100	16	2.0	32.0	9.9	158.4
150	17	2.4	40.8	10.0	170.0
		100.0	615.2	100.0	1,111.1

Diagram 2. Crushing data on the basis of sieves—0.40 ton per horsepower-hour per hour

Mesh	Lever Arm	Feed: Weight, Per Cent	Feed: Moment	Discharge: Weight, Per Cent	Discharge: Moment
26.67 mm.	1	1.1	1.1		
18.85 mm.	1.41	4.2	5.9		
13.33 mm.	2	17.0	34.0		
9.42 mm.	2.82	22.5	63.4		
3	4	14.2	56.8		
4	5.64	9.2	51.8	0.3	1.7
6	8	6.9	55.2	7.8	62.4
8	11.28	5.4	60.9	22.1	249.3
10	16	3.1	49.6	13.5	216.0
		20.4			
14	22.56	2.8	63.2	11.1	250.4
20	32	2.0	64.0	8.0	256.0
28	45.12	1.9	85.7	5.9	266.2
35	64	2.0	128.0	4.4	281.6
				66.8	
48	90.24	2.0	180.5	4.0	361.0
65	128	1.3	166.4	3.0	384.0
100	180.48	2.0	361.0	9.9	1,786.8
150	256	2.4	614.4	10.0	2,560.0
		100.0	2,041.9	100.0	6,675.4

Diagram 3—Crushing data on the basis of surface—0.40 ton per horsepower-hour per hour

Table II—Theoretical Number of Grains Produced by Crushing From and to a Given Size When the Configurations Are Not Changed

Mesh	Mean Aperture, Mm.	Theoretical Number of Grains	Mesh	Mean Aperture, Mm.	Theoretical Number of Grains
26.67–22.43	24.64	1	16– 20	0.915	19,500
22.43–18.85	20.72	1.68	20– 24	0.770	32,800
18.85–15.85	17.41	2.83	24– 28	0.647	55,100
15.85–13.33	14.64	4.77	28– 32	0.544	92,900
13.33–11.20	12.31	8.02	32– 35	0.458	156,000
11.20– 9.42	10.349	13.3	35– 42	0.385	261,000
9.42– 2½	8.706	22.7	42– 48	0.324	439,000
2½ – 3	7.322	38.1	48– 60	0.272	747,000
3 – 3½	6.169	63.7	60– 65	0.228	1,270,000
3½ – 4	5.176	108	65– 80	0.192	2,110,000
4 – 5	4.347	182	80–100	0.162	3,540,000
5 – 6	3.658	306	100–115	0.136	5,950,000
6 – 8	2.587	864	150–170	0.0963	16,800,000
8 – 9	2.179	1,450	170–200	0.0813	27,800,000
9 –10	1.823	2,470	200–240	0.0701	43,400,000
10 –12	1.529	4,180	240–270	0.0598	70,900,000
12 –14	1.287	7,010	270–325	0.0482	134,000,000
14 –16	1.083	11,800	....	......	....

Table III—Theoretical and Observed Number of Grains From Unit Size of Chert and From Unit Size of Dolomite

		Chert — Weight Mean Unit Grain = 27.15			Dolomite — Weight Mean Unit Grain = 29.75		
		Observed			Observed		
Mesh	Theoretical Number of Grains	Weight of 100 Grains in Grams	Number of Grains	Per Cent Deviation	Weight of 100 Grains in Grams	Number of Grains	Per Cent Deviation
2 – 2½	22.7	93.37	29.0	27.7	118.2	25.2	11.0
2½– 3	38.1	59.19	45.9	20.4	66.8	44.5	16.8
3 – 3½	63.7	39.07	69.5	9.1	47.1	63.2	—0.8
3½– 4	108	24.14	112	3.7	24.9	119	10.2
4 – 5	182	13.29	204	12.0	14.9	199	9.3
5 – 6	306	7.70	352	15.0	8.96	332	8.5
6 – 7	516	4.89	555	7.5	5.41	550	6.6
7 – 8	864	2.81	965	11.6	3.39	877	1.5
8 – 9	1,450	1.65	1,640	13.1	1.88	1,580	8.9
9 –10	2,470	1.02	2,660	7.7	1.18	2,520	2.0
10 –12	4,180	0.61	4,480	7.2	0.734	4,060	—2.9
12 –14	7,010	0.36	7,510	7.1	0.427	6,960	—0.7
14 –16	11,800	0.226	12,000	1.7	0.240	12,400	5.1
16 –20	19,500	0.129	20,900	7.2	0.160	18,600	—4.6
20 –24	32,800	0.0735	36,900	12.5	0.0853	34,900	6.4
24 –28	55,100	0.0437	62,100	12.7	0.0548	57,400	4.2
28 –32	92,900	0.0246	110,000	16.4	0.0287	103,600	11.5
32 –35	156,000	0.0159	186,000	19.2	0.0180	165,000	5.8
35 –42	261,000	0.00917	296,000	13.4	0.0109	273,000	4.6
42 –48	439,000	0.00556	478,000	8.9	0.00627	474,000	8.0
48 –60	747,000	0.00349	776,000	3.9	0.00389	765,000	2.4
60 –65	1,270,000	0.00232	1,170,000	—7.9	0.00252	1,180,000	—7.6

which means that there was a reduction of 4.96 sieves in crushing. The ratio may be found by raising 1.414 (the ratio of the openings of two consecutive screens) to the 4.96 power or by interpolating for the screen openings and taking the ratio. This ratio found (about 6:1) will be the ratio of mean mesh sizes, obviously a figure which more nearly expresses the work that has been done than the maximum size.

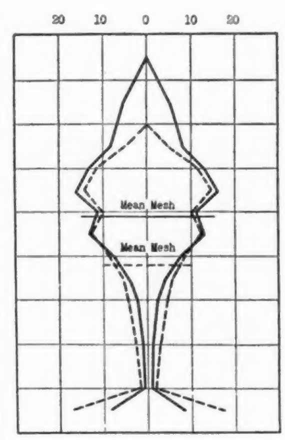
But the actual work of crushing is proportional to the new surface exposed, so to be accurate the points on the lever arm should be spaced according to the surface exposed for each mesh size. The "moments" calculated with these distances express *work*. Diagram No. 3 shows them calculated in this way, and it shows that 66.8 — 20.4 *surface units* were created by the rolls in crushing.

The tonnage crushed was 0.40 tons per horsepower hour per hour, [(3400 ÷ 24) ÷ 350]. Multiplying 66.8 — 20.4, or 46.4, surface units by 0.40, we have 18.56 *surface tons*. This is a concrete figure, "as specific as 70 deg. F. or 40 miles per hour," the paper states. Thus the method may be used to find the overall efficiency of any crushing or grinding machine.

Rolls Test.
Rolls 36" x 15", Allis-Chalmers Spring Type.

February 21, 1928.

Actual Rolls Feed					
Mesh	Weight Per cent W	Lever Arm: Mean Mesh M	Lever Arm: Mean Surface S	Moments: Mesh W x M	Moments: Surface W x S
1.05	2.2	1	1	2.2	2.2
74	5.0	2	1.41	10.0	7.1
.52	6.3	3	2	18.9	12.6
37	8.3	4	2.82	33.2	23.4
3	13.0	5	4	65.0	52.0
4	16.1	6	5.64	96.6	90.8
6	11.3	7	8	79.1	90.4
8	13.4	8	11.28	107.2	151.2
10	7.3	9	16	65.7	116.8
14	3.3	10	22.56	33.0	74.4
20	1.8	11	32	19.3	57.6
28	1.3	12	45.12	15.6	58.7
35	.9	13	64	11.7	57.6
48	7	14	90.24	9.8	63.2
65	4	15	128	6.0	51.2
-65	8.7	16	180.48	139.2	1,570.2
	100.0			713.0	2,479.4



Actual Rolls Discharge					
Mesh	Weight Per cent W	Lever Arm: Mean Mesh M	Lever Arm: Mean Surface S	Moments: Mesh W x M	Moments: Surface W x S
.37	4.7	4	2.82	18.8	13.3
3	11.0	5	4	55.0	44.0
4	14.6	6	5.64	87.6	82.3
6	10.9	7	8	76.3	87.2
8	13.0	8	11.28	104.0	146.6
10	8.8	9	16	79.2	140.8
14	5.5	10	22.56	55.0	124.1
20	4.5	11	32	49.5	144.0
28	3.5	12	45.12	42.0	157.9
35	2.5	13	64	32.5	160.0
48	2.0	14	90.24	28.0	180.5
65	1.4	15	128	21.0	179.2
-65	17.6	16	180.48	281.6	3,176.4
	100.0			930.5	4,636.3

Mean Mesh of Feed - 3.202 mm.
Mean Mesh of Discharge - 1.501 mm.
Reduction Ratio by Mean Mesh - 2.1
Mean Surface of Feed - 24.79
Mean Surface of Discharge - 46.36
Units of Surface Reduction = 46.36 - 24.79 = 21.57

Tons per hour - 95.87
Horse power input - 85.0
Tons per horse power hour - 1.13
Surface tons per horse power hour
21.57 x 1.13 = 24.4

Fig. 1. Detail chart of rolls test

Two Laws of Crushing

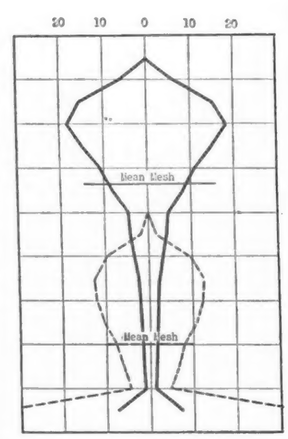
The above method is correct only insofar as the lengths on the lever arm really represent the surface exposed for the different mesh sizes. This point is gone into very thoroughly in the paper. The author bases his reasoning on two laws of crushing: (1) That when a cube is broken into smaller cubes the *total surfaces* are inversely as the linear dimensions; (2) when a cube is broken into smaller cubes the number of grains is inversely as the cube of the linear dimensions. The same principles apply to other shapes.

Concerning these the paper says: "When confronted with the results of (1) we have always been abashed because the cubes do not break into cubes but into all manner of shapes. Means were not available for finding the actual surface. On the other hand (2) may be tested regardless of homogeniety. If the number of grains is found to correspond with the ideal based on the cube theory (2) it is likely that the surface theory (1) will not lead one far astray. Hence the premise will be that sieves will give *relative surfaces*. . . . As one warms up to the problem of testing (2) by counting and weighing one begins to feel that the premise is rational."

(Rolls Test Continued).

February 21, 1928.

New (Original) Rolls Feed					
Mesh	Weight Per cent W	Lever Arm: Mean Mesh M	Lever Arm: Mean Surface S	Moments: Mesh W x M	Moments: Surface W x S
1.05	5.4	1	1	5.4	5.4
.74	15.2	2	1.41	30.4	21.4
.52	13.3	3	2	54.9	36.6
.37	15.2	4	2.82	60.8	42.9
3	10.7	5	4	53.5	42.8
4	8.1	6	5.64	48.6	45.7
6	4.4	7	8	30.8	35.2
8	4.1	8	11.28	32.8	46.2
10	2.9	9	16	26.1	46.4
14	2.1	10	22.56	21.0	47.4
20	2.0	11	32	22.0	64.0
28	1.5	12	45.12	18.0	67.7
35	1.2	13	64	15.6	76.8
48	1.0	14	90.24	14.0	90.2
65	.7	15	128	10.5	89.6
-65	7.2	16	180.48	115.2	1,299.5
	100.0			559.6	2,057.8



Finished (Undersize) Rolls Discharge					
Mesh	Weight Per cent W	Lever Arm: Mean Mesh M	Lever Arm: Mean Surface S	Moments: Mesh W x M	Moments: Surface W x S
8	1.4	8	11.28	11.2	15.8
10	9.6	9	16	86.4	153.6
14	12.7	10	22.56	127.0	286.5
20	12.2	11	32	134.2	390.4
28	10.5	12	45.12	126.0	473.8
35	7.8	13	64	101.4	499.2
48	6.3	14	90.24	88.2	568.5
65	4.5	15	128	67.5	576.0
-65	35.0	16	180.48	560.0	6,316.8
	100.0			1301.9	9,280.6

Mean Mesh of Feed - 5.491
Mean Mesh of Discharge - 0.415
Reduction Ratio by Mean Mesh - 13.2
Mean Surface of Feed - 20.58
Mean Surface of Discharge - 92.81
Units of Surface Reduction 92.81 - 20.58 = 72.23

Tons per hour 27.17
Horse power input - 85.0
Tons per horse power hour 0.32
Surface tons per horse power hour
72.23 x .32 = 23.1

Fig. 2. Chart showing details of further rolls tests

Results and Their Application

The result of this counting and weighing is shown in Tables II and III. For this comparison the author has taken not the usual Tyler standard series, but the double Tyler standard, based on the fourth root of 2. And the sizes of the grains are figured between the consecutive meshes. The table of deviations shows that in some cases the deviation is rather large, yet the theory as a whole appears sufficiently close to be taken as a working method. As he states: "The problem is to get a formula, even though it may be crude and of the ox-cart type. The ox-cart served a worthy purpose in its day and we are in the ox-cart stage in our study of grinding."

Two charts, Figs. 1 and 2, show how the method may be applied to a test of crushing rolls. The data for feed and discharge are given in the columns and the diagram between them is a plotting of the sizing analyses. The heavy line represents the analysis of the feed, the dotted line that of the discharge.

Water Measurement for Rock Products Plants

Some Possible Methods of Quickly Determining the Proper Instruments and Procedure

By Arthur C. Hewitt
Chief Engineer, American Lime and Stone Co., Bellefonte, Pa.

OPERATING MEN are frequently faced with the problems of measuring or estimating the flow of water. Just as often it is not expedient to purchase, rent or borrow suitable metering equipment and to rig up measuring boxes is usually a time consuming and costly procedure. Sometimes it is desirable to gage the flow of water in a small stream, and then most of us are even more helpless. The object of this article is to give a brief description of various possible methods of measuring flowing water in such a way that operators can quickly decide just which is desirable for any given case.

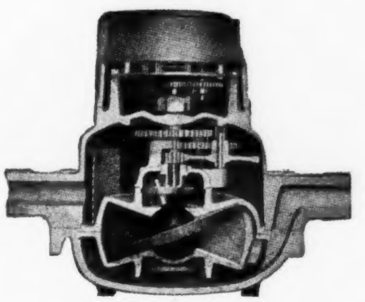


Fig. 1. Disc type meter

There are many possible ways to measure flowing water, some of which are:

(a) Positive displacement meters:
- Revolving disc type.
- Piston type.
- Toothed gear type.

(b) Orifice meters:
- Plain orifice.
- Venturi type.

(c) Actual weight measurement.

(d) Impact meters:
- Impact against plate.
- Turbine type.
- Nozzle discharge.

(e) Weirs:
- Submerged.
- V-notch.

(f) Velocity measurement by calculation from fall at nozzle.

Each of these methods has its particular advantages and disadvantages. In some cases a person has a choice of more than one way to accomplish desired results, while at other times conditions may narrow down so that only one way can be considered.

Positive Displacement Meters

Positive displacement meters are usually considered for use on ordinary cold water that is free from grit or sediment forming materials where the rate of flow is comparatively slow. The revolving disc type is commonly used for house metering and similar service. The piston or gear types are sometimes used where it is desired to control the flow and measure at the same time. These three types of positive displacement meters are commonly used where total flow is the information desired. Where a study of the various rates of flow during a certain period is required it is customary to use one of the other types of meters. Piston and gear types are very seldom used since some require the external application of power to operate them.* Positive displacement meters of the disc type are commonly used on 2-in. pipe and smaller sizes, but they are made up to 6-in. size. Revolving disc meters are now made in mass production and are reasonably cheap and very accurate.

Orifice Type Meters

During recent years the orifice type meter has become very popular for measurement of liquids, both cold and hot, for boiler feed water, liquids in factory processes, etc. This

*The original Schaffer continuous hydrator made by the Schaffer Engineering and Equipment Co., Pittsburgh, was equipped with a piston type water meter driven by the poidmeter that measured the flow of lime.

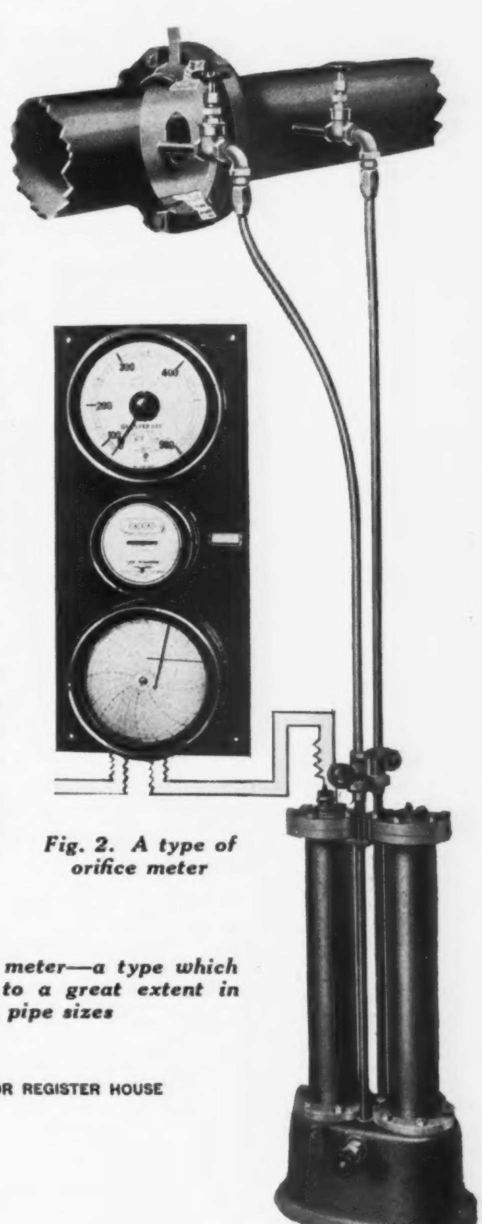


Fig. 2. A type of orifice meter

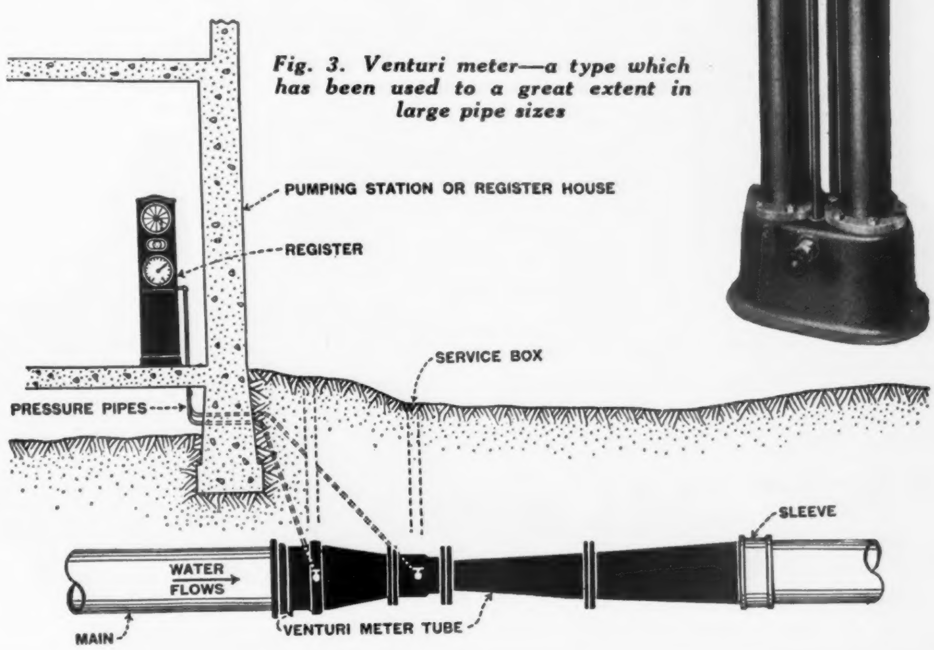


Fig. 3. Venturi meter—a type which has been used to a great extent in large pipe sizes

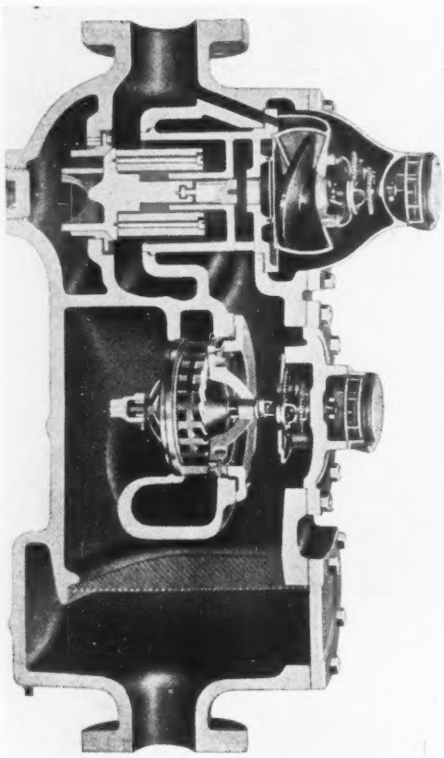


Fig. 6. Compound turbine and disc meter

type of meter has been developed to a very high degree of accuracy under wide variation of rate of flow, and has the additional advantage that the indicating and recording portion of the meter may be easily placed at a distance from the orifice. Orifice type meters are rarely used on pipes under 2-in. in size and they are very apt to be less accurate in the smaller sizes than in the larger. This type of meter depends on the very small drop in pressure that occurs at the orifice for measuring the rate of flow. Such meters, with proper calibration, are suitable for measuring steam and many other materials as well as water. Fig. 2 shows a well known type or orifice meter that is giving excellent results in every day use.† This type is probably used more for metering steam than for any other single use, but it is also good for water measurement.

The Venturi meter (Fig. 3)‡ is a form of orifice meter and antedates by many years the practical application of the ordinary type of orifice meter. Giovanni Venturi (Italy, 1746-1822) discovered the principle of this meter, but it was not until about 1887 that Clemens Herschel demonstrated that the idea had a practical application. The Venturi meter probably has been used in large pipe sizes to a greater extent than all other types put together. The largest size of which the writer has knowledge is 41x44 ft. at the new Conowingo, Md., power house on the Susquehanna river. Others range in size from 210 in. in diameter down.

Actual volume or weight measurement of water is often resorted to in making tests on steam boilers. Lacking other more convenient meters, three barrels can be rigged up as indicated in Fig. 4 to measure water flow either by volume or weight, and permit continuous flow to a pump or other unit.

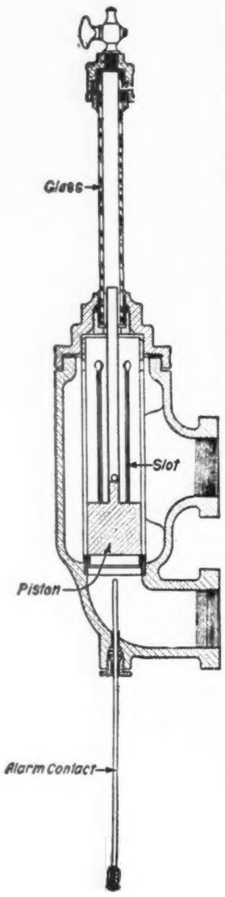


Fig. 5. Simple form of impact meter

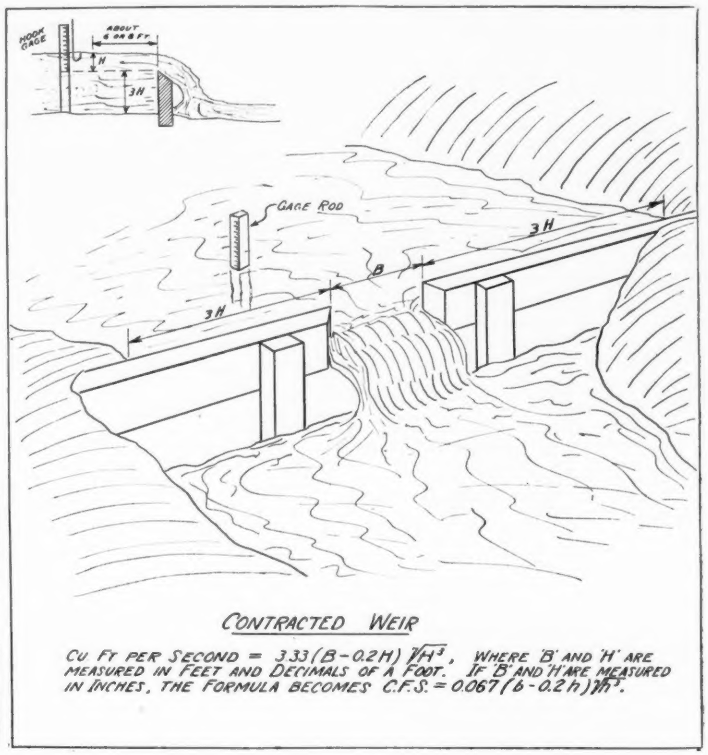


Fig. 7. An old type of contracted weir long used for measuring stream flow

By filling one of the upper barrels while the other is being emptied will permit a continuous flow being taken from the lower barrel. With modern high capacity boilers such a rig might be much too slow.

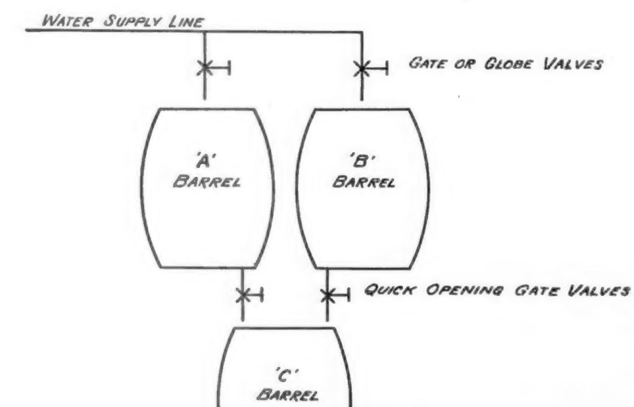


Fig. 4. Method of weighing or measuring boiler feed water

Impact or Velocity Meters

Recently there have come into use three types of meters which might be classed as impact or velocity meters. A very simply constructed indicating impact meter is shown in Fig. 5. This is limited at present to pipe sizes of 2½-in. down to ¾-in. and rates of flow from 1 to 100 gallons per minute. As shown in the illustration, the instrument consists of a cylindrical chamber with suitable pipe connections enclosing a slotted tube through which the liquid must pass. Inside this tube is a piston which moves up and down, exposing a slot area sufficient to allow any flow of liquid within the limits of the meter. The movement of the piston indicates on the scale the amount of flow in gallons per minute, which is directly proportional to the area of the slots in the enclosed tube, or to the rise or fall of the piston.

An electric contact consisting of an adjustable insulated brass rod located at the

†Republic Flow Meters Co., Chicago, Ill.

‡Builders Iron Foundry, Providence, R. I.

*Spray Engineering Co., Boston, Mass.

bottom of the chamber can be connected to a lamp or bell, to call attention when the flow has fallen below a fixed minimum. The electric contact device may be adjusted to operate at any capacity within the range of the meter.

Turbine Type Meter

The turbine type meter shown in Fig. 6† is dependent upon velocity or impact for its operation. At present this type is used in 2-in. to 12-in. pipe sizes and is especially good for high velocities. Where such a meter must be accurate for extremely low velocities as well as high velocities, it is built in a single case together with a disc type unit in combination with a vertical wing and pilot change over valve. When the flow is beyond the capacity of the disc meter, the operation of the automatic change over valve causes the turbine meter to register. As the flow decreases the reverse action is effected.

A third impact type of meter for use in measuring the discharge from a hose nozzle consists of a pressure gage connected to a lens shaped disc. The disc is held so that it cuts the center of the nozzle discharge in such a manner that a very small hole in one edge of the disc permits impact pressure to register on the gage dial. The dial may be graduated to read in pounds pressure from which the flow may be calculated when the nozzle diameter is known. This is the type of meter used by fire underwriters inspectors to determine the quantity of water thrown from hose nozzles or as a check on the capacity of the pumping unit.

Weirs

Weirs are commonly used for measurement of stream flow. One of the oldest types of weir consists of a board arranged as shown in Fig. 7. The up-stream edge of the weir should be sharp, and the width should be about two-thirds of the natural width of the stream to be measured. This is known as a contracted weir, because the ends are contracted to make a narrow discharge stream. A submerged weir is similar to an ordinary dam the full width of the stream. Formulae for calculation of water flow over various types of weirs can be obtained from many engineers' handbooks.

†Worthington Pump and Machinery Corp., New York.

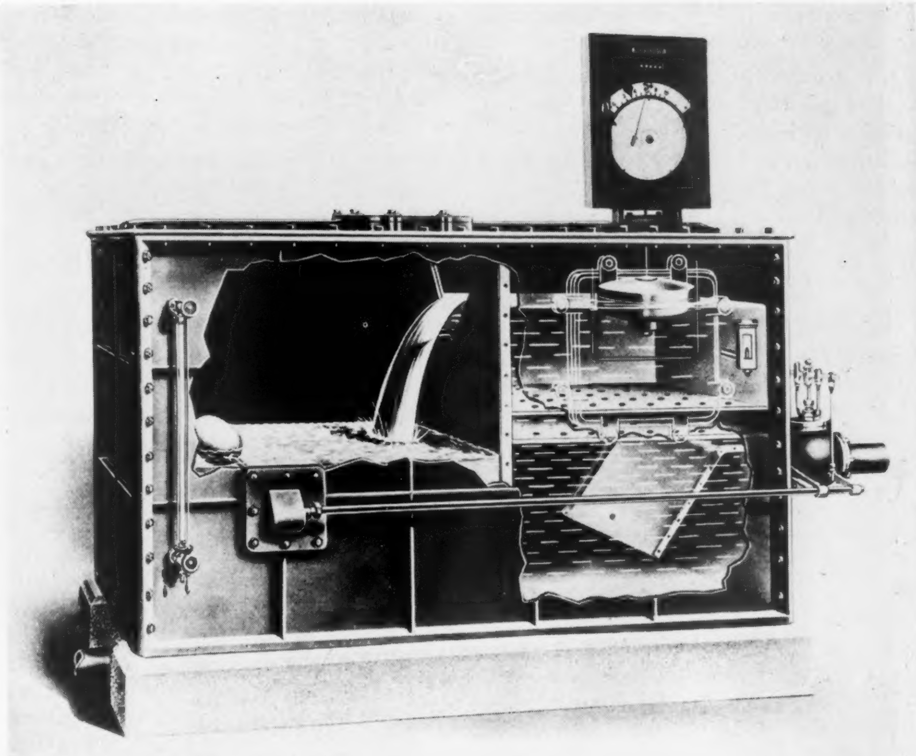


Fig. 8. A V-notch meter, quite accurate in measuring boiler feed water

The V-notch weir‡ has been perfected recently and is extremely accurate as manufactured commercially for the metering of boiler feed water (See Fig. 8). From published data, the writer has plotted curves for the discharge of water over 60 deg. and 90 deg. V-notch weirs. These are shown in Figs. 9 and 10. The formula for the 60 deg. weir is $Q = 0.4706\ H^{2.47}$ while that for the 90 deg. notch is $Q = 0.31358\ H^{2.48}$ where Q = discharge in cubic feet per minute and

‡Cochrane Corp., Philadelphia, Penn.

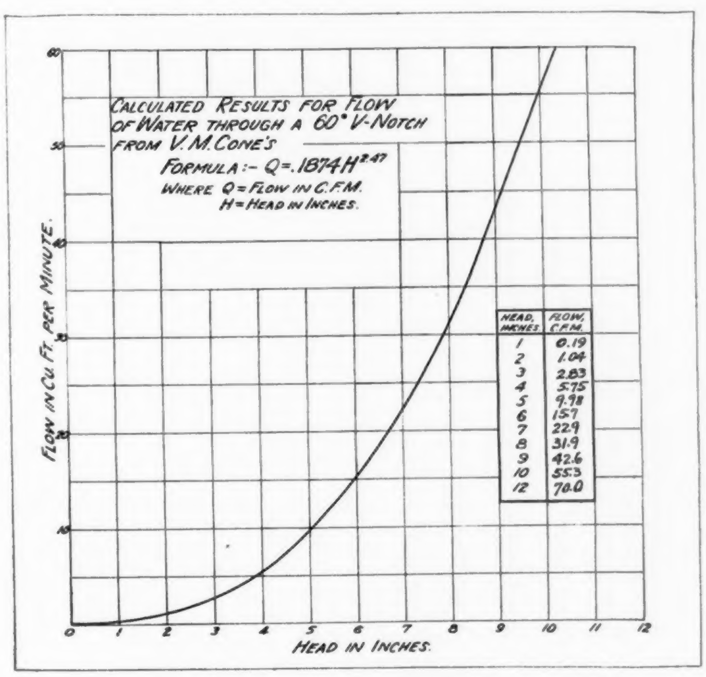


Fig. 9. Calculated results for flow of water through a 60 deg. V-notch

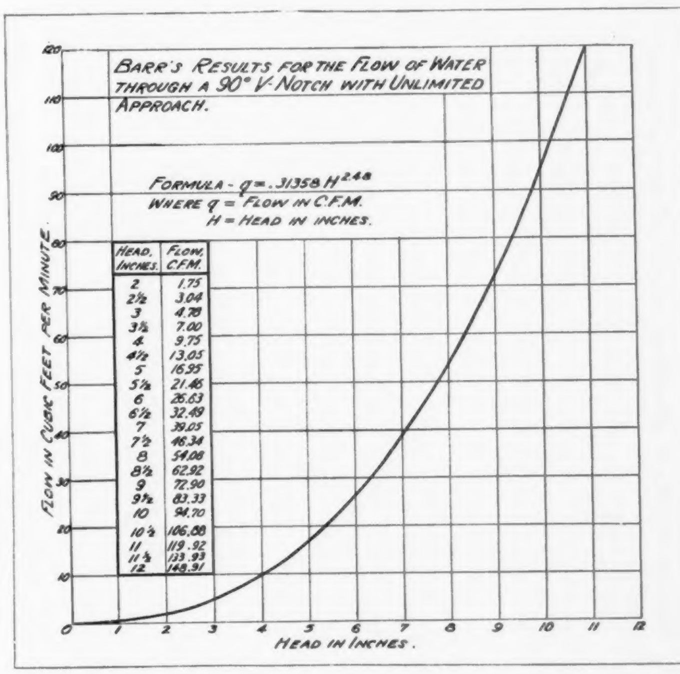


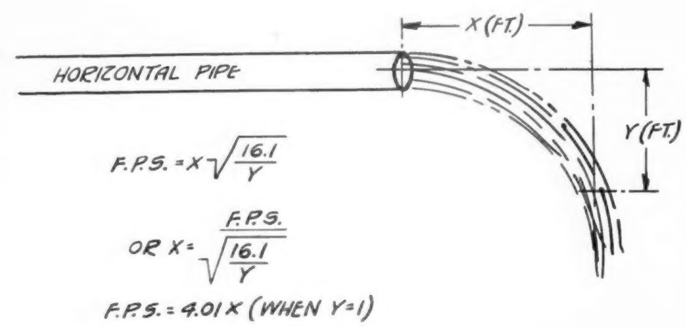
Fig. 10. Results for the flow of water through a 90 deg. V-notch with unlimited approach

H is the total head of water in inches measured above the point of the notch.

It is possible to measure approximately the flow of water as discharged from the end of a horizontal pipe by making use of the law of falling bodies. By measuring the horizontal and vertical distances X and Y in feet and applying in the formula

$$\text{f.p.s.} = X \sqrt{\frac{16.1}{Y}}$$

the velocity of discharge can be calculated. If the distance Y is 1 ft., then the formula can be simplified to read f.p.s. = 4.01 X, where f.p.s. is feet per second. The write has drawn up a chart (Fig. 11) giving gallons per minute discharged from various sized pipes at various velocities and on the same chart is a curve giving the X measurements for various velocities. This chart will be found very handy and will give results that are approximately correct.



			PIPE SIZE								
			1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	3"	4"	6"
			PIPE AREAS-SQ. INCHES								
			.3048	.5333	.8626	1.496	2.038	3.356	7.388	12.73	28.888
F.P.S.	X	Y	GALLONS PER MINUTE								
.5	1 1/2"	12"	.47	.83	1.3	2.3	3.1	5.2	11.5	20	45
1.0	2 15/16	12"	.95	1.6	2.7	4.6	6.4	10.5	23	40	90
5.0	14 7/8"	12"	4.7	8.3	13	23	32	52	115	200	450
10	29 3/4"	12"	9.5	17	27	47	64	105	230	400	900
15	44 5/8"	12"	14.0	25	40	70	95	157	346	597	1355
20	59 1/2"	12"	19.0	33	54	93	127	210	462	796	1806
25	74 3/8"	12"	23.8	42	67	117	159	262	577	995	2258

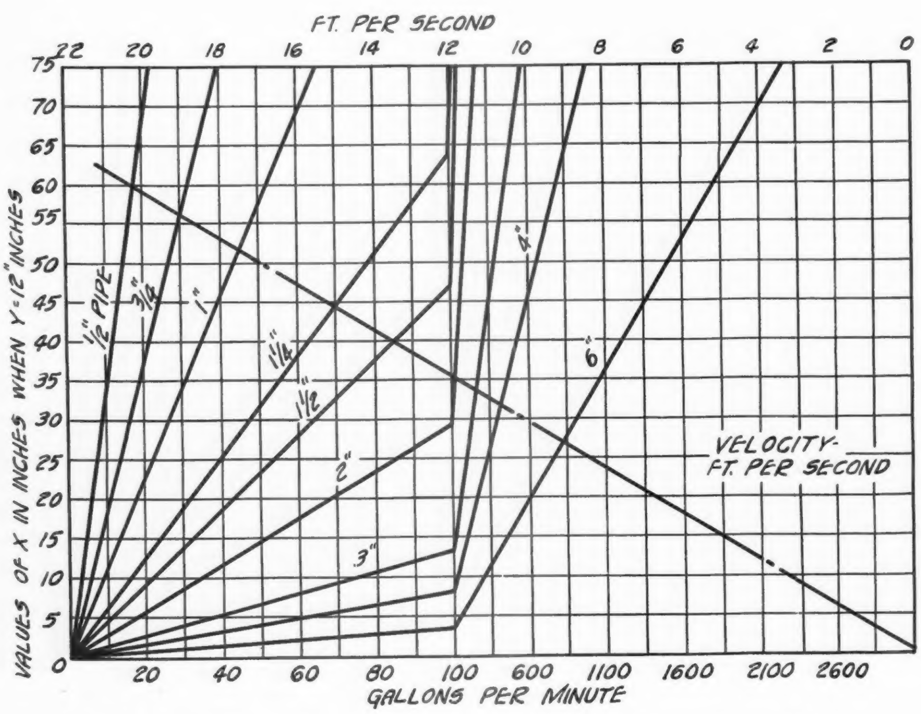


Fig. 11. Discharge (g.p.m.) from various sized pipe at various velocities

Contractors to Help Stabilize Credit Situation for Building Material Producers

BUILDING contractors, representing an annual aggregate buying power of approximately $3,000,000,000, meeting quietly at Cleveland recently, took steps toward the elimination of unethical buying practices in the building industry, it is announced by the Associated General Contractors of America.

Characterizing many of the current policies of both sellers and buyers of building materials and services as ruinous to the industry as well as detrimental to the public, the conference called by the Allied Construction Industries Committee laid plans for the nation wide establishment of standard credit policies aimed to relieve the industry of the tremendous burden of bad accounts which it was claimed were as injurious to legitimate contractor buyers as to sellers.

Compilations of itemized bad accounts in Detroit alone reveal $4,000,000 in unpaid balances owed by contractors announced George B. Walbridge, general contractor of that city, who is chairman of the national allied committee and who heads the credit rehabilitation bureau there.

This figure, claimed Mr. Walbridge, by no means represents the total of overdue accounts in the Detroit industry it being estimated that an overdue total of $20,000,000 can be found there.

Similar estimates were presented from other cities where the plan for stabilizing credit in the construction industry has made progress. It was reported by Daniel W. Cauley, Manager of the Cleveland Branch of the National Association of Credit Men that he had data proving the annual loss in bad accounts amounted to $1,000,000 in his city annually because of loose credit practices which can be remedied through the plan being applied elsewhere.

The credit stabilization plan, said to represent the first move ever made by buyers to insist that sellers stiffen up their credit terms, was reported as under development in twenty cities. Plans were laid to immediately extend the plan to an additional score of communities and to accelerate the work already started.

The contractors gathered at Cleveland, representing thirteen national associations of general and subcontractors, likewise formulated standard rules of fair practice aimed to eliminate unfair back charges against subcontractors, the peddling and cutting of bids by buyers and sellers, forced acceptance of designated insurance carriers and other matters involving ethical business relationships.

Plans were laid to hold a trade practice conference with the Federal Trade Commission in order that formulation and enforcement of these and additional rules of fair practice may be made effectively.

Pebble Phosphate Losses

THE UNITED STATES Bureau of Mines and the University of Alabama have published Serial No. 2925, by H. M. Lawrence, entitled "Losses of Phosphate in the Sand-Pebble District of Florida." The relation of the phosphates lost to the present washing practices is discussed, as well as estimated costs and methods of reclaiming this material.

Design of Sand and Gravel Washing and Screening Plants

Part II. Design—Stripping—Excavation

By Frank M. Welch
Chief Engineer, American Aggregates Corp., Greenville, Ohio

THE FIRST OF THIS SERIES, covering some of the fundamentals of the sand and gravel industry, appeared in the April 27 issue.

Designing the Plant

After the deposit has been selected from the standpoints of quality, location, market, acreage, depth, overburden, shipping facilities, and competition, it is found that all of these qualifications must again be considered in the determination of the type, size, and requirements of the plant. Not only these qualifications, but even further conditions, such as topography of ground, extent of deposit above and below water, and available power facilities, have a very important bearing on the design. All of these elements not only affect the washing, screening, and crushing operations, but also the excavating and loading.

When it is borne in mind that there are so many conditions affecting the most suitable method of carrying out each of the many operations involved, there is little wonder that we hear so often the statement: "There is no such thing as a hand-me-down gravel plant." It is likewise very fortunate that a large percentage of men engaged in the sand and gravel business are men of mechanical instincts, whose ingenuity and resourcefulness have brought forth a large variety of methods from which the engineer may select the most economical for each link of the entire operation.

The Economical Plant

In speaking of the most economical methods in sand and gravel production, that word "economical" covers a lot of territory and involves a great deal more than the mere saving of power and labor. An economical gravel plant primarily is one that will function every hour of the working day, every working day of the month and every month of the operating season. This applies especially to the busiest and most lucrative months. This elimination of breakdowns and delays is not of greatest value because it reduces maintenance costs, but because it minimizes the delays. To have any part of a plant break down during the busiest part of the operating season, causing a shut-down for a few days or even a few hours, often costs more money on account of the delay than the entire power bill for a month, or the weekly payroll. Therefore the first consideration should be heavy, surefire, foolproof equipment so far as possible. After that, lay out the plant along those lines which require a minimum payroll, low power costs, low maintenance, and the fewest number of mechanical units.

Factors Effecting Plant Design

As stated above, there are so many prevailing conditions and environments affecting the type and design of a gravel plant, that it is difficult for the writer to determine where to start in a discussion of this sort. If I dealt with every solution in detail, I would write a treatise of such volume that I know few gravel men would have time to wade through it, even if they had the inclination. I shall deal therefore with generalities.

To find a starting point, I shall take up the various operations, as far as possible, in accordance with a composite flow sheet of a number of average gravel plants under the more usual conditions, and follow the operations through which the gravel and sand pass, as they are taken from the deposit and go through the successive units.

Bearing the above program in mind, I will present the following outline, to which I will attempt to adhere in my discussions:

Stripping	Sand-settling tanks
Excavating	Water requirements
Transporting	Screening
Elevating	Distributing
Feeding	Mixing
Scalping	Storing
Crushing	Loading
Washing	Type of building
Power	

Stripping

Stripping, as stated in the outline above, is the first step in the conversion of a deposit into commercial material, providing this step is necessary at all. Some owners are fortunate enough to find little or no overburden on their deposits. Others located in some of the outlying territories where the specifications are not so rigid, will permit a foot or two of overburden to mix with the raw material, trusting to wash most of it out in the plant. This can be done if the deposit of gravel is 35 or 40 ft. deep and the scrubbing and washing equipment is modern and adequate. Although such methods will never produce as clean gravel as though the property were stripped, yet a very large overhead expense is saved if the stripping operation can be omitted.

Then there are the river deposits and other properties where the raw material lies entirely under water. Such deposits seldom are covered by an overburden, and if they are, the pumping or other excavating methods can usually be depended on to get the clay or loam fairly well dissolved in the water.

Prohibitive Overburden

On the other hand, many otherwise excellent commercial deposits are so overburdened that the cost of stripping is prohibitive. I have seen operations, however, where 15 to 18 ft. of overburden was being removed and disposed of at a great expense, which the location and quality of the deposit justified. The ordinary depth of overburden which justifies stripping runs from 1 to 6 ft. The most economical method of attack, then, depends on the topography of the land and on the method of excavation.

Where the surface of the ground is exceptionally rolling and the valleys drain to a swift stream or low ground to where the dirt can be flumed, hydraulic stripping, which is by far the least expensive, can be utilized. Comparatively few deposits are so fortunately situated, yet in our own operations we have several properties where part or all of the stripping can and is being done hydraulically. In such instances a 3- or 4-in. pipe line, served by a high pressure pump, a fire nozzle, and a couple of lengths of hose, serve to wash the overburden off the gravel and dispose of it.

Stripping With Dragline

Without doubt, the next choice in economical stripping methods occurs where the revolving dragline machine can and is being used for the main excavating unit. A large revolving dragline, with a long boom, can strip the property ahead of its excavating and between its car loading duties without wasting much time, power or labor. In this method the overburden is dumped by the drag bucket into the water, beyond the working face, where the gravel

has been removed. Of course this process cannot be followed if the deposit is deep enough to anticipate a second cut being taken at a later date.

When neither of the above methods can be used, it is usually necessary to excavate the overburden with a steam shovel, dragline or other digging unit, load it into dump cars, wagons or trucks, and transport it to the nearest available dumping area. Although this is quite expensive, it is unavoidable and probably is more commonly used than any of the other processes.

A recent interesting and economical method of disposing of stripping consists of a long portable belt conveyor, say, 150 ft. long, mounted on a power shovel caterpillar. This unit receives the overburden from the stripping shovel and carries it out and over the face of the deposit, beyond the path of the main excavating shovel and pit cars, where it is dumped into the excavated portion of the pit. It is propelled and driven electrically.

In plants where the main excavating unit is the cableway excavator, or where the bottomless drag is used, these machines often do their own stripping if necessary. In these cases, the overburden can sometimes be dumped into the excavation, but in other instances must be hauled away.

Wherever stripping must be handled as a separate operation in the Northern States, as much of it as possible should be accomplished during the winter months, while the plants are idle on account of freezing weather. This has a threefold advantage: First, it insures the stripping ahead and out of the way of the excavating units during the operating season; second, it often permits some of the main excavating units to be used for stripping purposes, thereby getting a full year's service out of a costly investment and possibly saving the purchase of a machine for excavating only; third, it furnishes work for the regular employes during the winter months, thereby holding the organization together and eliminating the floating element of labor.

Excavating

The excavating problem, according to the lay of the deposit, can be divided into three classes, namely:

1. Where the deposit is entirely above water.
2. Where the deposit is part above and part below water.
3. Where the deposit is entirely below water.

Where the deposit is entirely above water, the steam shovel and the revolving dragline are the most common excavating units employed, although in small, deep operations and in the opening of larger operations, the bottomless drag bucket has been found very efficient. The steam shovel operates in the pit at the foot of the working face and loads into dump cars or into a field hopper. Although in the larger operations the railroad type of shovel has been in most common use, the caterpillar or crawler type is now meeting with universal approval because of the labor and delay saved in the shifting of tracks. Likewise, the electric shovel is daily coming into more common use, again saving labor and inconvenience by eliminating the coal problem. In the Southern States and other localities where oil is cheap, various types of internal combustion engines are used for power on the shovels.

Where the surface of the ground is sufficiently level to permit, the revolving dragline is very commonly and efficiently used. This machine operates on top of the ground instead of in the pit, otherwise the above comments referring to the shovel also apply to the revolving drag. Each machine has its advantages according to conditions, such as the lay of the land, but as stated previously, the dragline can often "kill two birds with one stone" by dovetailing its stripping with the excavating.

Where the deposit is part above and part below water, the steam or electric shovel is of course limited to the excavation of a top cut down to the water level. Unless the depth of material above the water is great enough to justify two cuts, the entire deposit is usually excavated by one of the many under-water methods, permitting the gravel above the water to cave down. I will therefore proceed to the methods of excavating material from under water.

Digging in Submerged Deposits

There are seven methods in more or less common use for excavating sand and gravel from below water. Each has its advantages, disadvantages, and proper applications according to condition and nature of various deposits. Without attempting to list them according to comparative merits, they are:

The ladder dredge.
The dipper dredge.
The clamshell dredge.
The suction dredge.
The Ward Venturi system.
The revolving dragline.
The cableway excavator.

The ladder dredge consists of a heavy digging type of bucket elevator, constructed part or all of manganese steel and suspended usually through a well in the hull of a boat. It elevates the material as a rule to a point high enough above the deck to permit either preliminary screening or complete preparation for the market. These units have the advantage of lifting a large percentage of material and very little water to the top of the boat, but the wear and tear on the moving parts is very high. Ladder dredges are used more in the Eastern states.

The dipper dredge might be called a floating steam shovel. The depth to which it can dig is so limited that its use is not common.

The clamshell dredge is also little used, because of its inability to penetrate hard deposits under water and the fact that water constantly leaking from its jaws carries too large a percentage of fines with it.

Suction Dredges

The suction dredge consists of a centrifugal pump, from 6 in. to 24 or 30 in. diameter suction, according to capacity required, mounted on a hull, with the suction extending to the bottom of the lake. These pumps are usually constructed with manganese steel shells and runners and discharge either on to barges or through pipe lines supported on pontoons to a shore plant. Some operators pump the material high enough above the boat to do some screening, as do the ladder dredge operators, but pumping much above the lake or river level is not economical because of the excess weight of water which must also be lifted. The suction line is usually mounted on a hinged ladder which in turn supports some one of the various types of cutters on the market. The different cutters also have their champions among the operators, and their merits doubtless depend considerably on prevailing conditions.

In our own operations, where excavating from under water, we use the suction dredge. We find that less stripping and less washing in the plant is required on account of the repeated agitation, churning, scrubbing and washing which occurs as the material and water rush through the pipe lines and pump. We also find the suction dredge economical of labor, power and maintenance.

The fifth type of dredge listed above is the Ward-Venturi. This is a revision of the suction dredge wherein the Venturi method of pumping has been successfully applied, perfected and patented by F. L. Ward of the Ward Sand and Gravel Co., Oxford, Mich. This method apparently has considerable merit in that large percentages of solids are obtained and the ordinary high pump maintenance is greatly reduced because the gravel and sand do not pass through the pumps.

In all of the five dredge types of operations described above, considerable variation occurs in the construction, type and size of the boats. Many of them ply up or down rivers so far from their docks that their own power must be generated on board and living quarters for their crews for both day and night shifts are included in the cabin. As stated above, some partly or entirely complete their screening operations on board and load marketable commercial material on to barges tied alongside. Some even have crushing equipment on deck. Some are of steel construction, some of wood, and some a combination of both. It goes without saying that the steel construction is longer lived except in salt water; and in some localities the steel boat is little more expensive than the timber construction.

Some of the dredges are anchored, some are held in position by shore lines, and some with spuds. Some have shore lines forward

and spuds aft. All of them are equipped with multiple-drummed hoists for handling the ladders, suction pipes, shores lines, and spuds. All of them have sump pumps to prevent water collecting in the hulls.

The operation of the revolving dragline has been described above under the discussion of dry excavating. The dragline now presents the added advantage of going below water for its material as well as above. It can load on to barges or into cars.

The cableway excavator is used very extensively and very satisfactorily on the small or medium sized operations for digging under water. It has the distinct advantage of eliminating the necessity of any elevating equipment on the plant, as it discharges into a hopper anywhere from 50 to 100 ft. above the water level. One man operates the entire excavating, transporting and elevating system.

Again referring to our own experiences, we have found that where a sufficient depth of gravel extends below water to permit pumping, we use this method, regardless of how high the deposit extends above the water. We find that although our power bill is somewhat higher than where we excavate by shovel or revolving dragline, that this extra power cost is counteracted several fold by the reduction in labor. On one of our average plants shipping 60 to 80 cars in 10 hours, our payroll will contain about six less men at our pumping operation than at a plant where we excavate with steam shovel or dragline.

(To be continued.)

A 50-car per day plant, excavating material by 12-in. suction dredge and steam shovel from deposit partly below water

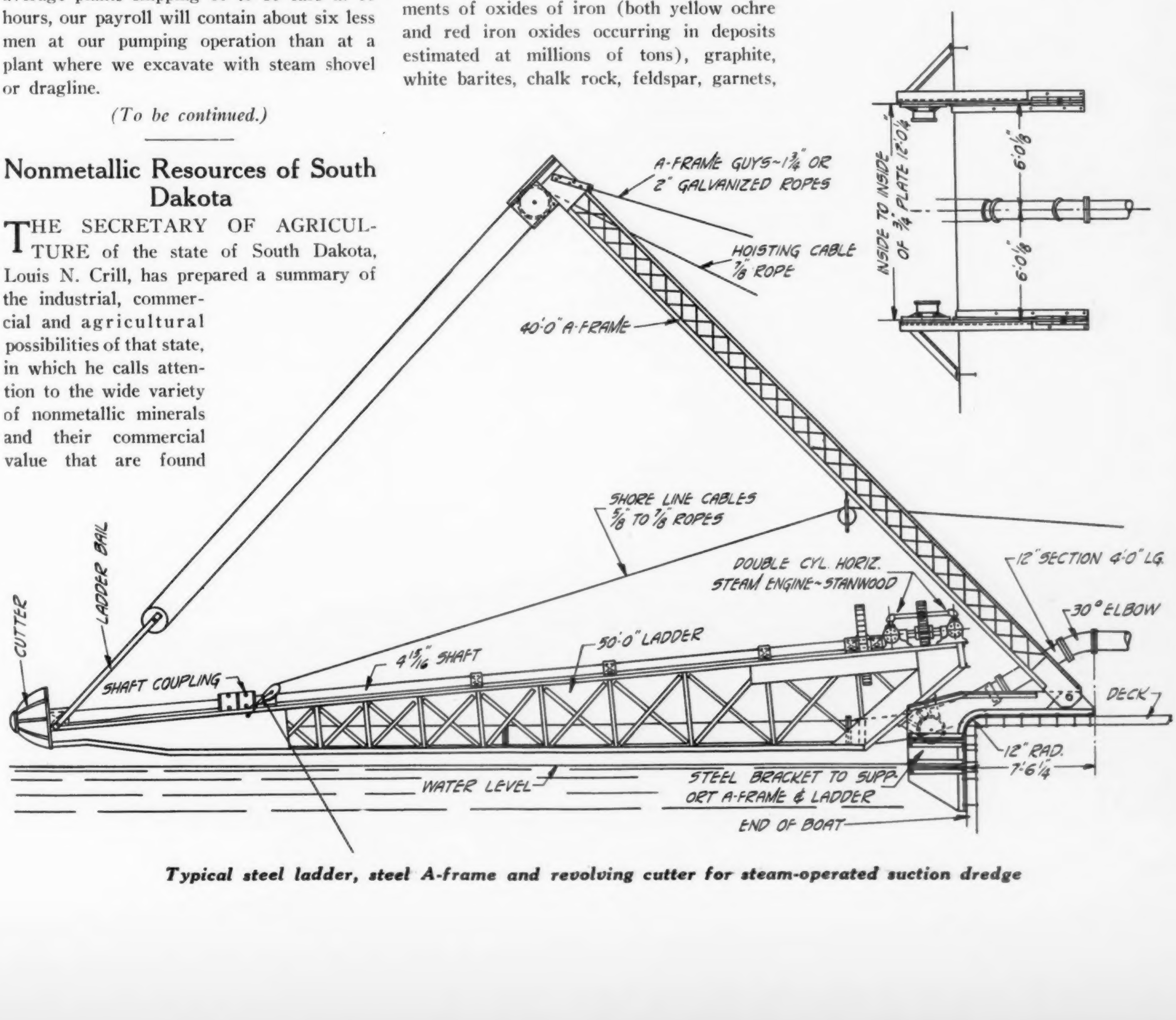
Nonmetallic Resources of South Dakota

THE SECRETARY OF AGRICULTURE of the state of South Dakota, Louis N. Crill, has prepared a summary of the industrial, commercial and agricultural possibilities of that state, in which he calls attention to the wide variety of nonmetallic minerals and their commercial value that are found there, especially in the Black Hills section.

This section of the state has long been famous as a producer of gold and silver, but until recently the nonmetallic resources were not known, except locally, and the purpose of the survey is to place these facts in a condensed form for those interested in the industrial development of the west.

Among the most promising nonmetallic minerals might be mentioned: paint pigments of oxides of iron (both yellow ochre and red iron oxides occurring in deposits estimated at millions of tons), graphite, white barites, chalk rock, feldspar, garnets, gypsum, etc. The list of commercial minerals, both metallic and nonmetallic, some of which are extremely rare, is so imposing that the state has been called the jewel box of America.

The report calls attention to the possibilities of glass manufacture, as the district is well supplied with glass sands and glaze-forming minerals, the industry to use gas for fuel from western Wyoming's oil fields.



Typical steel ladder, steel A-frame and revolving cutter for steam-operated suction dredge

The Rock Products Industry Around Columbus, Ohio

Several Active and Up-to-Date Gravel Plants and the World's Most Complete Quarry Products Operation

By W. B. Lenhart
Associate Editor, Rock Products

OWING to the unprecedented early spring this year throughout the entire central Atlantic states, the rock products industry adjacent to Columbus, Ohio, started off with a rush, catching most of the operators with depleted stockpiles and in some cases in the midst of their annual winter overhauling of plant and haulage equipment. This condition was further aggravated by the users of sand and gravel especially calling on the producers heavily in their efforts to take advantage of the early, favorable building weather. During the middle of April several days of rainy weather started in and temporarily delayed shipments, giving the producers an opportunity to catch up.

Welch avenue plant of the American Aggregates Corp.

All the sand and gravel producers in this locality reported that the volume of business in 1929 would be satisfactory from both a tonnage and price standpoint.

At the session of the Ohio legislature which ended during April, 1929, the gasoline tax was increased from 3 to 4 cents per gallon, and the additional money will be used for highway construction purposes.

Most of the structural material is for highway construction and industrial buildings. While "Class A" building construction is only fair, the lack is offset by increased building of smaller homes and apartments. Two of the larger operators enjoy a fairly large railroad ballast business, which from indications is increasing.

Good Gravel at Fair Price

All the producers who now furnish gravel ballast in this section are preparing a screened, graded and washed gravel material and can deliver a product with a high percentage of crushed material in the mix if it is desired. In some cases the contents of this material will be as high as 70% crushed gravel. The producers are turning out an excellent product cheaply and are carrying on a vigorous sales campaign, intending to get their fair share of this class of business. It is reported that on some sections of the Pennsylvania railroad they are actually covering other ballasts with this sized and washed gravel.

There are five principal producers of sand and gravel at Columbus, having a total capacity of approximately 12,500 tons per 10-hr. day. They are: The American Aggregates Corp., with three plants; the Arrow Sand and Gravel Co., with two plants; the Island Sand and Gravel Co., the Jackson Sand and Gravel Co. and the Ohio Sand and Gravel Co., with one plant each. The first two listed above are the only producers of railway ballast in this district.

Skipway at the Welch avenue plant

A break in the levee opposite the Welch avenue plant interfered with early spring operations

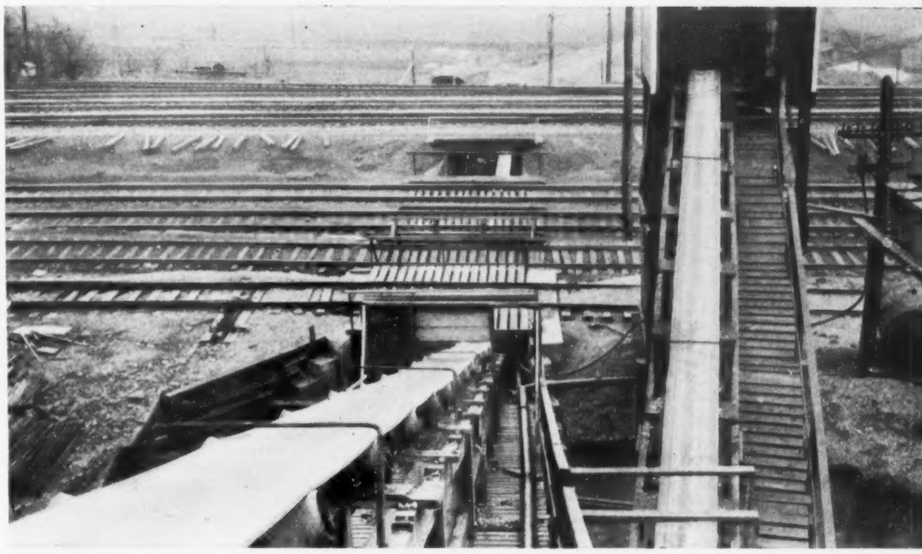
Revamping an Old Gravel Plant

No new plants have been built in the district in the past year, although the American Aggregates Corp. took over the former Concrete Materials Co. plant, located on Dublin road between the Scioto river and Grand View avenue, and during February and March spent $30,000 on the plant, installing a balanced single-drum hoist which serves two 5-ton steel skips delivering the bank gravel from the hopper-bottom cars to the gravel screens.

In addition, two new 60-in. by 18-ft. gravel screens equipped with double jackets sand screens were installed, and a drag classifier. All of this equipment was manufactured in the shops of the Greenville Manufacturing Works, a subsidiary of the American Aggregates Corp. A two-deck Simplicity vibrating screen was also installed, which at present produces ½-in. to 1¼-in. gravel, from ¼-in. to 1¼-in. feed on the upper

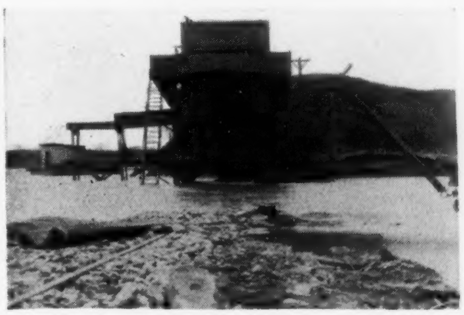
screen surface, and a $\frac{1}{8}$-in. to $\frac{1}{2}$-in. pea gravel from the second screen surface. The small amount of sand from this screening is wasted.

The two new gravel screens are of unusual design, having a main barrel of $1\frac{3}{4}$-in. round perforations and the first outer jacket of $1\frac{1}{4}$-in. round perforations and an outer sand jacket of $\frac{1}{4}$x$\frac{3}{4}$-in. slotted wire cloth, with the long axis of the slots in the direction of rotation. The inner barrel has 2 ft. of blank surface at each end and $14\frac{1}{2}$ ft. of perforations. The first jacket has $13\frac{1}{2}$ ft. of perforations and the outer $12\frac{1}{2}$ ft. of wire cloth. Water is supplied through a 6-in. pipe paralleling the center axis of the main barrel with the nozzles so directed as to strike the gravel load. A 20-hp. motor is required to drive each of these screens.



Belt conveyors carry washed material to the distributing yard of the American Aggregates Corp.

Sand and gravel operations have been conducted at this plant on an extensive scale for a number of years and a large part of the areas adjacent to the plant have been worked out; consequently, loading operations are conducted at an unusually long distance from the plant. To further increase the reserves of bank gravel, the company has come into control of a considerable area along the Scioto river, but at a distance of about $1\frac{1}{2}$ miles from the plant. To reach this deposit with their industrial track it was necessary to drive a tunnel under Dublin road at a total cost of another $30,000. This tunnel is roughly 12x14 ft., with a length of 700 ft. and is lined with thick walls and has a top slab of reinforced concrete. Later a second tunnel will have to be put through under Grand View avenue, but this will not entail such an expenditure as the first tunnel, as it will be much shorter in length. This new area will give the company a total of 240 acres of gravel-bearing land, running in depths of from 30 to 40 ft., with an overburden of 2 to 4 ft., and will supply the company for 15 years, it is estimated.

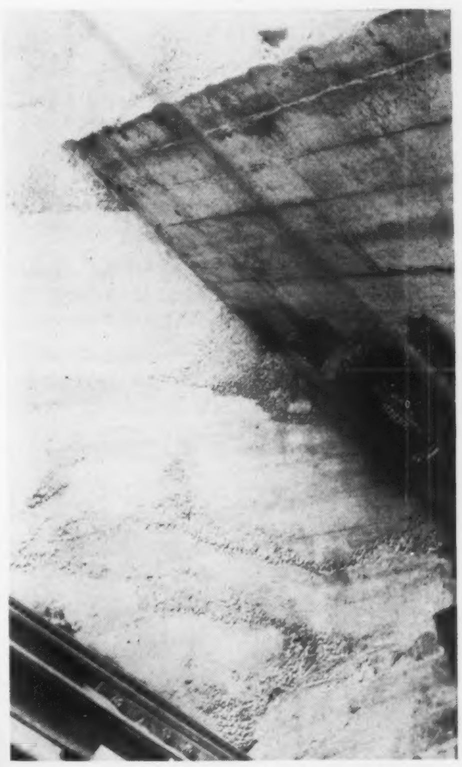


Field hoppers used in connection with dredging operations of the American Aggregates Corp.

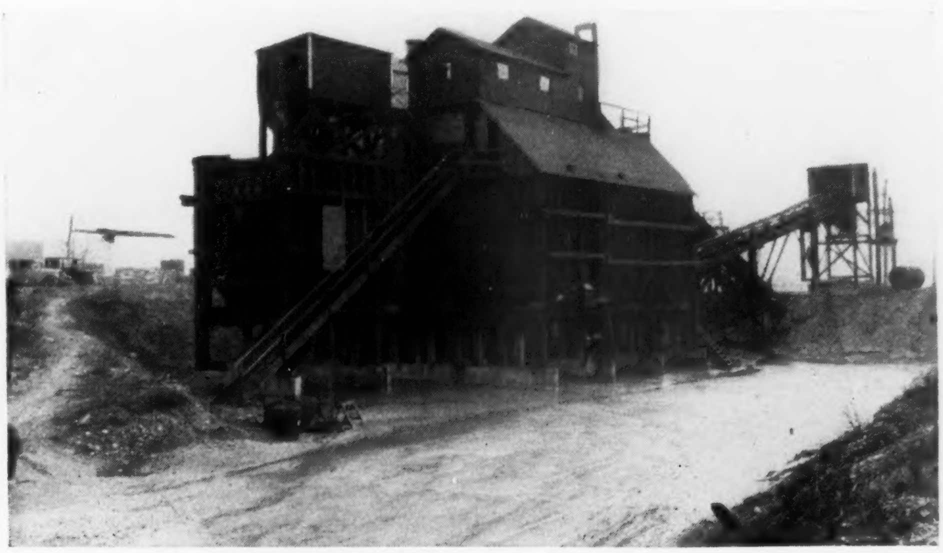
This plant is served by the Big Four, Pennsylvania and Hocking Valley railroads. The capacity of the plant is quoted at 4000 tons per day and it employs 20 men per shift, four of whom are on stripping.

The gravel is loaded by a 4-yd. Bucyrus dragline excavator and delivered to the plant in 30- to 40-ton steel, hopper-bottom gondolas, which are dumped into a new concrete pit from which the two skips are loaded. The skips pass at a steep angle under this pit and are loaded from two sets of pneumatically operated slide gates, which were supplied by the Greenville Manufacturing Works, Greenville, Ohio. The older plant received its material from a single skip.

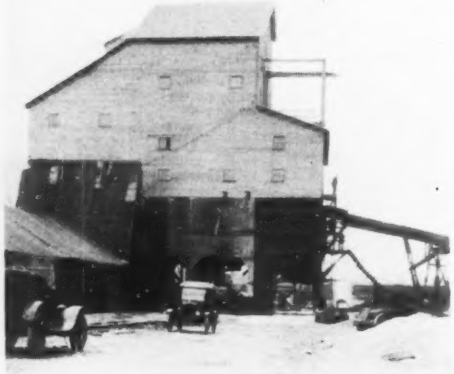
This plant does not have a ready-mixed concrete operation in connection with its activities, nor does it produce a mixed aggregate, this phase of the company's business is all being conducted at its Welch avenue plant near Barthman avenue. At 45 Barthman avenue the company has a truck



Air-operated gates in the tunnel at the Dublin road plant, American Aggregates Corp.



American Aggregates Corp. distributing yard at Columbus



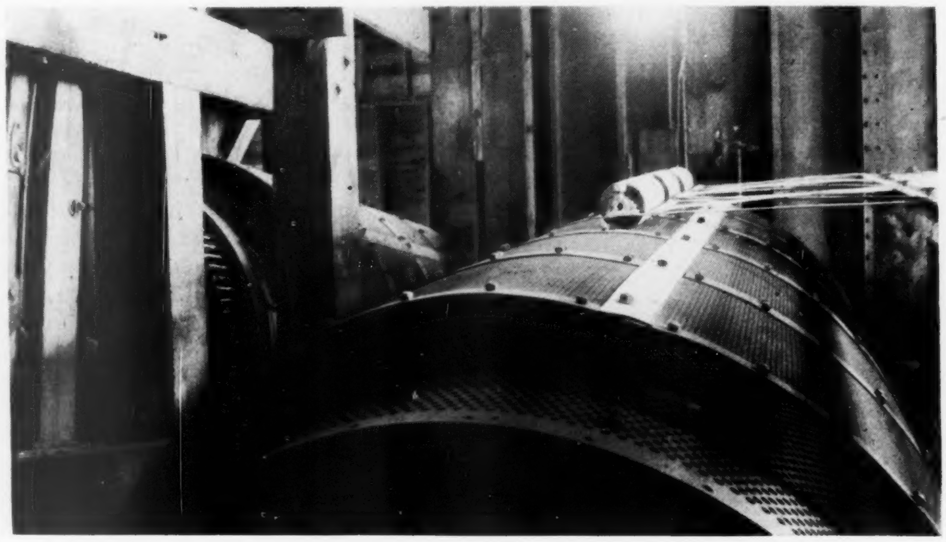
The Dublin road plant of the American Aggregates Corp., which was recently modernized

distributing yard, where it recently constructed a concrete products plant, which is operated under the name of the Permanent Concrete Products Co. This latter company manufactures special shapes, railroad crossing slabs, government mail box posts, fence posts, etc., as well as a ready-mixed concrete plant. The sand and gravel is secured from the Welch avenue plant by means of a belt conveyor passing under the tracks. Cement is unloaded by a Fuller-Kinyon pump. This same conveyor serves a series of storage bins from which commercial stone can be drawn to truck or discharged to a belt conveyor for preparing ready-mixed aggregates.

Supplementing Dredge Operation With a Railroad

At the Welch avenue plant of the American Aggregates Corp. sand and gravel was formerly pumped direct from the dredge to the plant, but here, too, operations are conducted at such a distance from the plant that the extra power required for pumping and the heavy maintenance charges on the pipe lines necessitated a rather unusual change in practice. At the present time gravel is dredged from the bed of the Scioto river and pumped a short distance to a steel field hopper from which the product is loaded to hopper bottom cars and delivered to the skip-loading pockets. The field hopper is so designed that a separation can be made here if desirable, sending the sands to waste via a steel flume, or the entire mixture may be loaded for shipment to the plant.

At the time of inspection heavy rains and overflowed waters from the Scioto river had inundated the tracks approaching the hopper, temporarily interrupting operations. This plant has a capacity of 4000 tons per day of washed and sized aggregate.



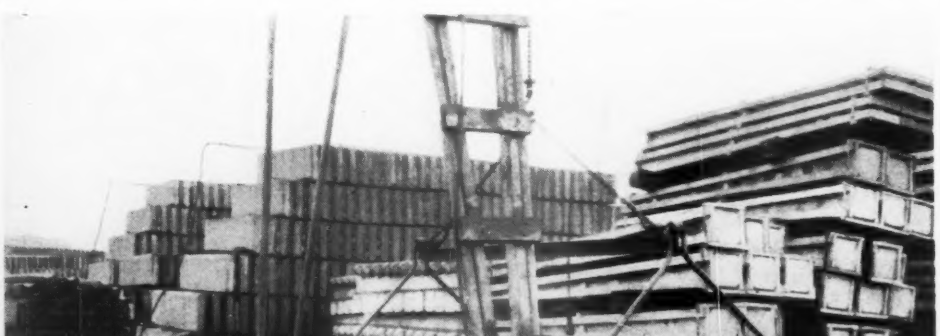
New double-jacketed sizing screens at the Dublin road plant

The Arrow Sand and Gravel Company Operation

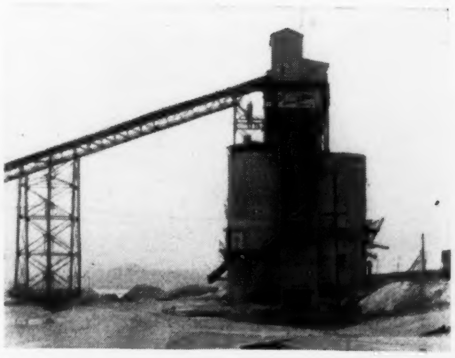
This enterprising company has two plants in operation in the Columbus district; the one at Grand View avenue and the Big Four tracks is the older and is across the Scioto river from the Dublin avenue plant of the American Aggregates Corp. The plant has a capacity of 2000 tons per day, producing various sizes of commercial products, ballast, etc. No ready-mixed aggregate or concrete is prepared at this plant, all of this class of operations being centered at the newer Franklin plant of this company, located at Mound and Furnace streets. This latter plant was built in 1926-27 and was described in detail in the October 15, 1927, issue of ROCK PRODUCTS. At that time it was described as one of the most modern sand and gravel plants in the United States. The plant as a whole has not been changed and with the recent addition of a truck mixing concrete plant and equipment for loading and batching aggregates, the whole operation can, without stretching the point, still be described as a most modern operation.

Probably the most interesting phase of the Franklin plant has been the addition of a truck-mixed concrete mixer plant, consisting of a Blaw-Knox batcher, which receives the properly proportioned gravel, sand, crushed gravel, etc., from a belt conveyor fed by spouts from the proper storage silos. This conveyor can discharge direct to cars or trucks for mixed aggregate or to an open bucket elevator serving the Blaw-Knox batcher.

The bagged portland cement is stored in a separate warehouse and is dumped to a small floor hopper which feeds an upwardly inclined screw conveyor, that in turn delivers direct to the Barrymore truck mixing trucks. At present only two trucks are in this service, although Stephen Stephanian, vice-president and general manager of the company, is having four additional trucks built after plans of his own design. In this connection it might be recalled that some 12 years ago Mr. Stephanian built a transit mixing device, but owing to various conditions, among which might be mentioned that trucks at that time had not been sufficiently developed to make the scheme thoroughly practicable, the idea was temporarily



Storage yard of the Permanent Concrete Products Co., a subsidiary of the American Aggregates Corp.



Grand View plant, Arrow Sand and Gravel Co.

abandoned. Later, as trucks became mechanically perfected and highways became further developed, the idea did not seem so far in advance of the times, so the Arrow Sand and Gravel Co. again entered the truck mixing business in the early days of July, 1928.

Mixed Aggregate Business Growing

The addition of the belt conveyor for the preparation of mixed aggregates by the company demonstrates the trend of developments in that section, and practically all of the producers have or have expressed a desire to have means of preparing this product. The advantages claimed, and they are apparent, too, are that the concrete aggregate

Aggregate batcher and cement feeder screens make up the "truck" concrete mixing plant at the Arrow Sand and Gravel Co.

can be more accurately prepared; requires less room at the point of use, there being only one pile of aggregate necessary in contrast with several piles, less wheelbarrow work, is needed and there is less waste to the contractors.

Ready-Mixed Concrete Receiving Thorough Tryout

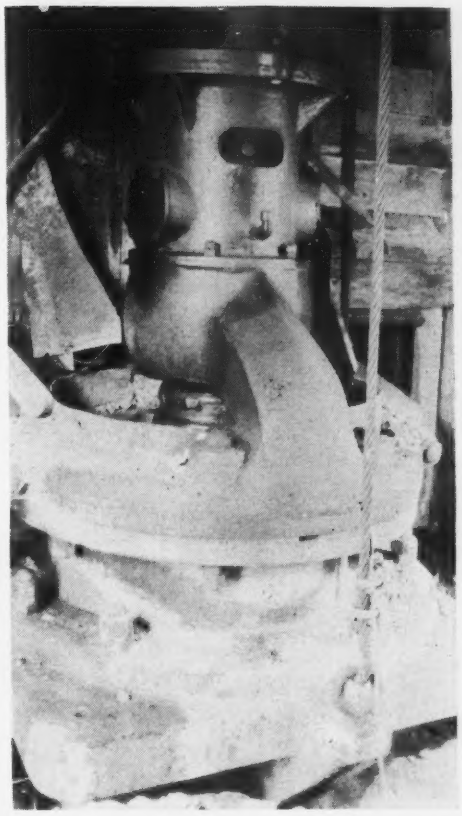
As to the possibilities in connection with ready-mixed or truck-mixed concrete on small jobs, there is no question but that, under normal conditions, a centrally located mixing plant can deliver concrete to the job at a profit to both the user and producer; and on many larger jobs where space is limited or where labor is inefficient or scarce, or both, the contractor who knows his costs has found it to his advantage to investigate this method of buying concrete.

There is no question but that a large, well financed and highly reputable concern which has large sums of money invested in a business will be just as conscientious in the preparation of ready-mixed concrete as the contractor.

However, as one sand and gravel producer

One of the storage piles at the Grand View plant

pointed out, there may be some cases on small jobs where the work is of such a nature that extra men are required to properly pour or lay the concrete quickly, so as to finish the operation before the material has started its initial set. These questions are just a few of those the producers and contractors are now ironing out in the Columbus district, which will decide the permanency of the ready-mixed concrete business, and from general observations in this



High-speed crusher at the Grand View plant used for recrushing

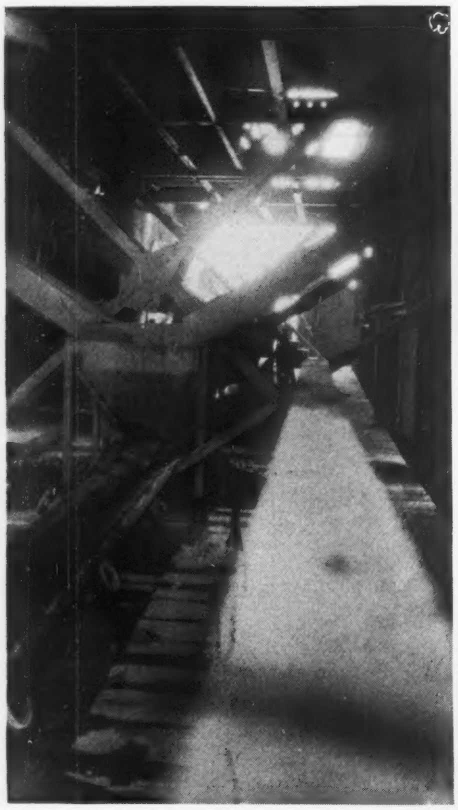
district the ready-mixed and transit-mixed concrete business is there to stay.

Other additional equipment which the Arrow Sand and Gravel Co. has installed since the plant was described includes a Jeffrey sand-settling tank, a Simplicity and a Robins vibrating screen for the preparation of plastering and masons' sand. This is a minus 10-mesh product with the fines removed. Also, three Hetzel field hoppers have been added to the ground storage reclaiming equipment. The field hoppers are loaded with a ¾-yd. Koehring crane, gasoline-motor-driven.

Special Truck Scales

In the yard offices of both the Grand View and Franklin plants, the Fairbanks-Morse truck scales have been equipped with a device known as a "Weightograph," an automatic weight indicator, which is made by

Distributing yard of the American Aggregates Corp. The new products plant of the Permanent Concrete Products Co. shows at the right



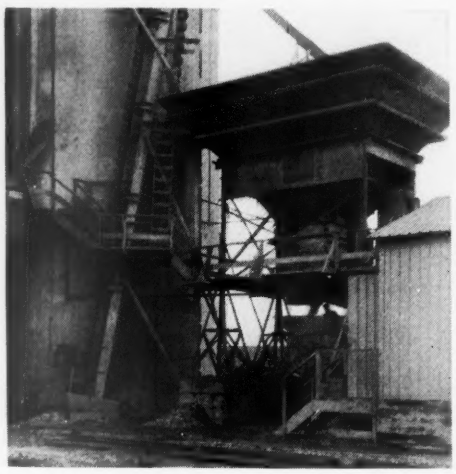
Proportioned amounts of sized aggregates are fed from the bins to the common belt conveyor serving the Arrow mixed aggregate plant

General view of the Ohio Sand and Gravel Co.'s plant

the Weightograph Co., St. Louis, Mo. This gives the scaleman a quick and accurate direct reading of the net weight of the load without having to resort to the use of the scale beam riders. The weight figures are reflected on a ground glass surface by means of an enclosed electric light, giving a large, easily read figure, and providing a beam scale with the advantage of a dial type scale.

The Ohio Sand and Gravel Company

This company operates a pit and washing plant about three miles from the center of Columbus proper, shipping sand and gravel for building purposes only, no ballast being sold. The bank material is loaded by an Osgood shovel to Western type cars for delivery to the hopper, under which is a



Trucks loading at batchers, Franklin plant, Arrow Sand and Gravel Co.

Jeffrey pan feeder, serving an 18-in. belt conveyor that delivers the product to the Jeffrey scalping screen.

The oversize from the scalper is crushed in an 8-in. Telsmith gyratory crusher and returned to the system for rescreening. The plant is very unusual in that all of the various sizes of stone from the sizing screen fall to separate bucket elevators, the boots of which are in rectangular tanks filled with water. These elevators deliver to separate bins and as a result of this arrangement the material gets a second washing, the water from the bucket draining off through perforated buckets. The plant has a capacity of 400 tons per day, employs seven men and requires 75 hp. to operate, 50 hp. being used for the line shaft serving the various elevators and screens and 25 hp. for the crusher. A Barber-Green loader is used for reclaiming and is said to have proven a quite satisfactory arrangement for their needs.

A gravel dredge working in flood conditions on the Scioto river

Cement hopper and screw feeder at the new "truck" concrete mixing plant, Arrow Sand and Gravel Co.

The offices of this company are at the plant on Hart road, and E. I. Washburn is

general manager and in charge of operations.

Jackson Pike Sand and Gravel Company

This company has a pit operation on Jackson pike only a few hundred yards from the plant of the Ohio Sand and Gravel Co., and depends solely on truck transportation for delivery of its materials to places of use. The plant has a capacity of 50 tons per hour and employs five men.

The deposit consists of 83 acres of gravel with practically no overburden and has a

One of the washing plants operated by the Marble Cliff company

higher percentage of sand than most of the plants in that vicinity. The operation consists of loading the bank material with a ¾-yd. Erie steam shovel to Koppel cars hauled by a Plymouth gasoline-driven locomotive.

The material is delivered to a hopper serving an 20-in belt conveyor, the oversize falling to a No. 4 Telsmith gyratory crusher,

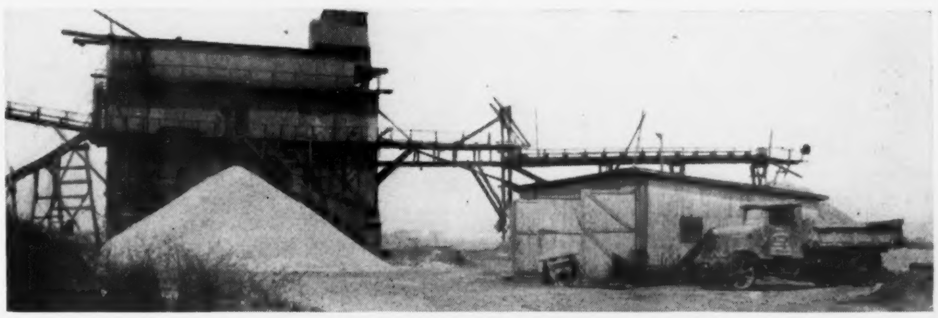
Storage yard and field hoppers, Arrow Sand and Gravel Co.

which discharges to a second belt conveyor, returning this product to the initial conveyor. The unwashed fines from the scalper all join on a third 18-in. belt. and are delivered to the screening and washing plant, and washed in a Jeffrey rotary screen of the same type as that used at the plant of the Ohio Sand and Gravel Co. V. S. Julian is president and manager; L. W. Innis, secretary and treasurer; Frank Smith, Paul S. Jackson and Roy E. Julian, directors, and H. H. Layton is superintendent.

Island Sand and Gravel Company

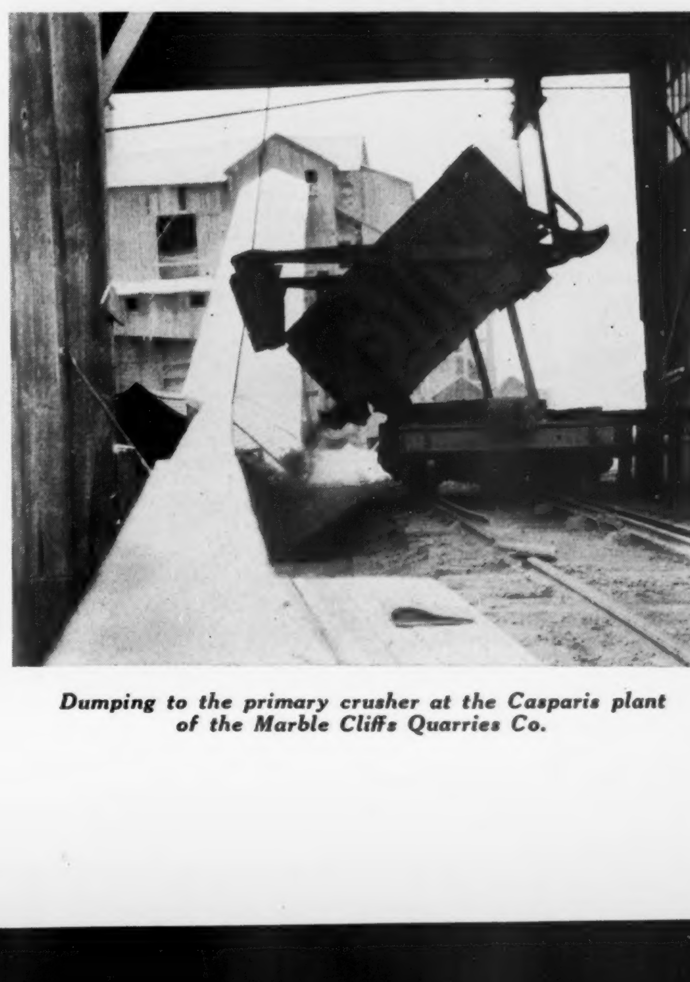
This company operates a small washing plant at Greenlawn street and the Sciota river, using a Sauerman slack-line cableway excavator for recovering materials from the bed of the Scioto river. At present the cableway bucket delivers to a grizzly over a steel hopper from which Western type cars are loaded and delivered to the washing plant by a cable and winch. The company is considering buying a small dredge.

The plant has a capacity of 700 tons per

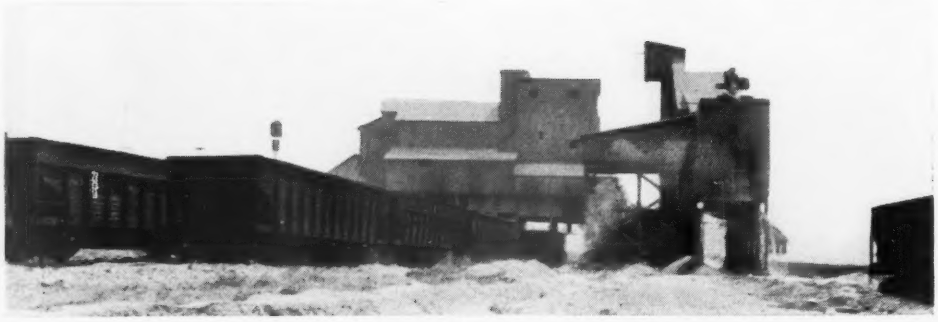


Jackson Pike Sand and Gravel Co. plant

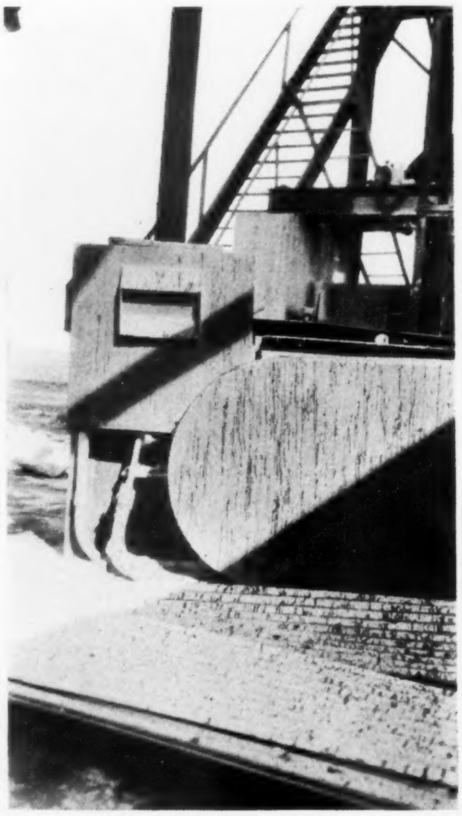
Mobile control tower for the electric haulage system at the Marble Cliffs Quarries Co.



Dumping to the primary crusher at the Casparis plant of the Marble Cliffs Quarries Co.



Ballast plant, one of the Marble Cliffs operations



Enclosed motors and drives at the Marble Cliffs asphalt plant

day and employs seven men. Mrs. A. W. Gill is president, O. Rhodes, general manager, and C. C. Saunders is superintendent.

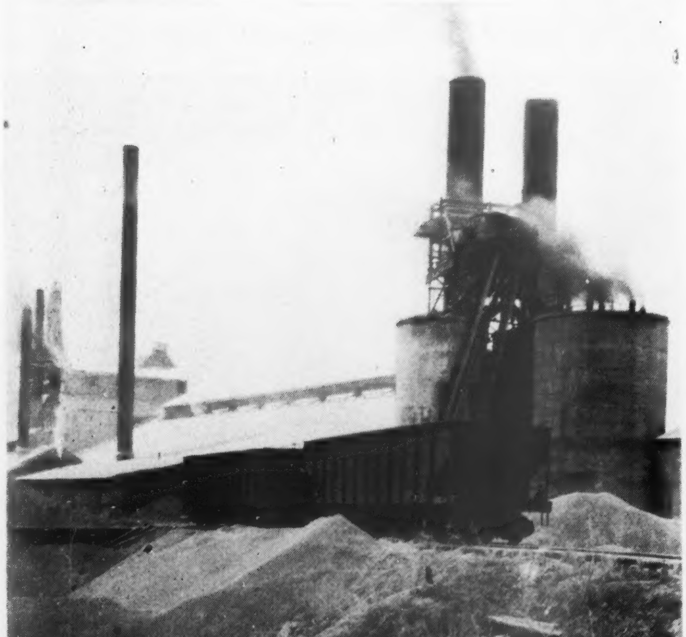
Crushed-Stone Operations—Marble Cliff Quarries Company

This company has one of the most diversified crushed limestone operations that can be found in the crushed-stone industry. It has a large flux stone plant, the fines from which pass to a washing and screening plant for the production of commercial stone and sand. This plant also is a source of material for the company's lime-burning operation, where two 8x140-ft. rotary kilns are used for burning. Brown recording thermometers are used for control, and at the time of inspection a temperature of 1200 deg. F. was recorded at the discharge end and 1700 deg. F. at the feed end. The hot point of the pyrometer giving the former reading was enclosed in a pipe with the end open but with the couple about 6 in. back from the end of the enclosing pipe. The pipe with its couple projected directly into the kiln from the discharge housing. The stone used is 1½-in. material.

Lime Operations

Some time ago the company started shipping quicklime, both lump and pulverized, in Bemis "Calsax" paper-lined, jute sacks and has found this to be a quite satisfactory method of handling the product. These sacks have waterproof paper liners cemented to the wall of the burlap sack, which makes a single unit of the liner and outer sack. This feature prevents rupture of the paper liner from not having the burlap's support-

Slack-line cableway system at the Island Sand and Gravel Co.



Lime plant, Marble Cliffs company

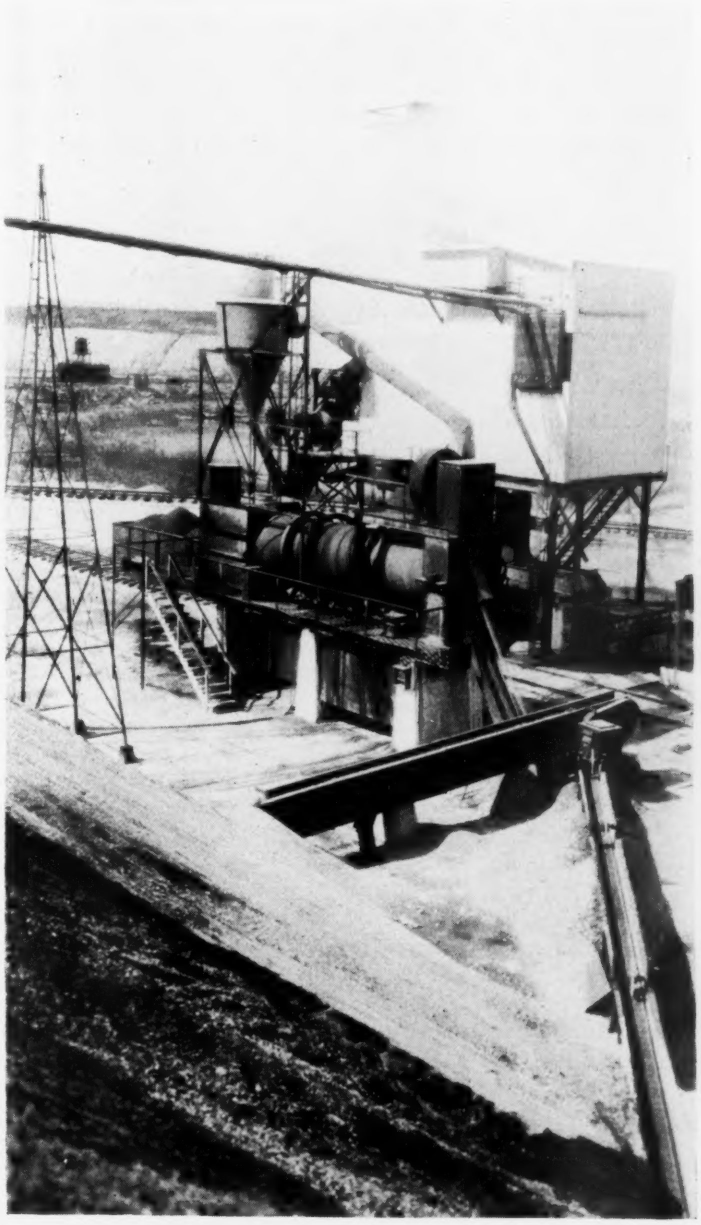
New asphalt mixing plant, Marble Cliffs company

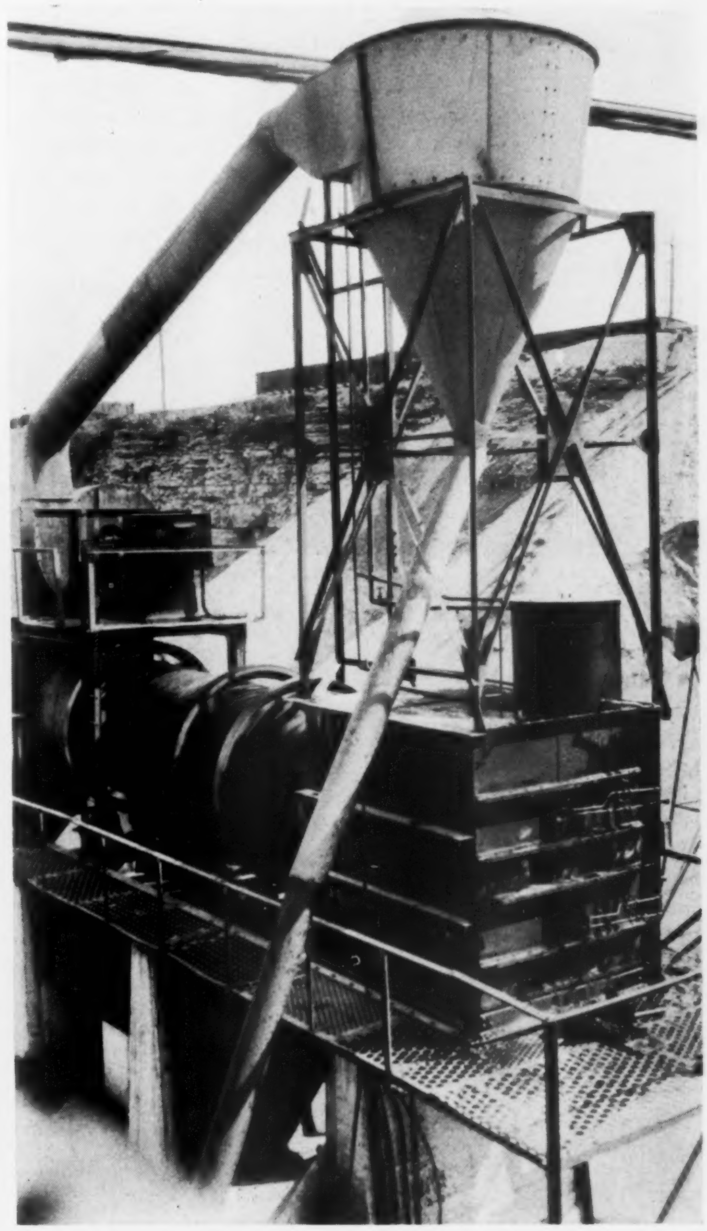
ing strength. The bag holds 90 lb. net, or ½ bbl., of quicklime, and can be filled with fairly hot material as well as the cold lime. It is said that there is practically no recarbonation in this type of sacks after several months' storage.

When in good condition the sacks are returnable for a credit and the sack and liner putty, using sands from the company's own classifiers and lime from its kilns.

This plant consists of a series of drag conveyors for delivery of the lime and sand to the mixing plant where the two are weighed into pug, or mixing, mills along with the necessary amount of water, after which the batch is dropped to storage bins limestone for flux stone and lime-burning purposes.

The Woodford centrally controlled electric haulage system is used for delivering stone to Plant X, and this operation was described in detail in the April 2, 1927, issue of ROCK PRODUCTS. Recently a Marion electric shovel, type 4160, on full crawler treads





Left—Marble Cliffs Quarries Co. asphalt plant. The drag conveyors are feeding the dryer from the stockpiles shown in the foreground. Right—A closeup of the rock dryer showing the fuel oil connections and the dust collector

are often called upon to make two to three trips.

Still more recently the company has been making shipments in the paper multi-walled sacks of the Bates Valve Bag Co. in which one of the walls is a waterproofed paper. This type of sack should also prove satisfactory for this class of material and a later report as to their value should prove interesting.

At Plant X is an operation for the preparation of ready-mixed lime mortar and lime for curing. As finely ground quicklime or "flash" lime, which is the trade name for this product, is used, the time required for curing is short. From these bins the mortar is drawn to trucks by gravity.

Quarry Plants

Quarry operations of this company extend over a very wide area, the pit being roughly a mile wide and several miles long, the upper levels supplying the commercial stone and the lower levels the higher calcium was placed in operation at this quarry.

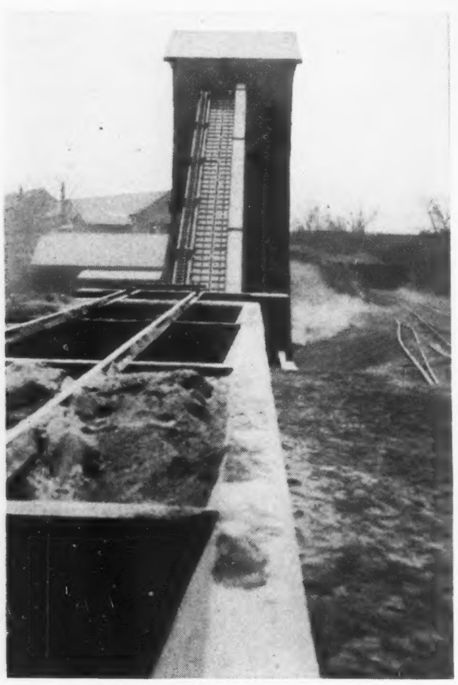
Marble Cliff's New Asphalt Coating Plant

In connection with Plant B, which is primarily a ballast and commercial stone plant, a new asphalt plant has been built and was placed in operation for the first time during April. At the time of inspection this plant was loading out its first car of cut-back asphalt mixture.

This plant is an all-steel structure, most

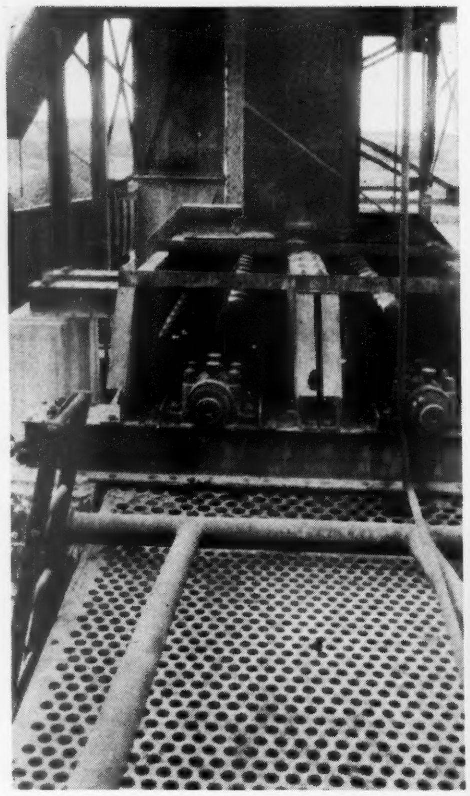
Part of the drag conveyor at the Marble Cliffs company asphalt plant

of which is enclosed in "Armco" corrugated iron, and its neatness of design and general appearance is very pleasing. A crushed-stone operation having its own asphalt plant is so out of the ordinary that a complete description is warranted. The site chosen for this operation is below the older crushed-stone plant, on what was the floor of earlier quarry operations, and alongside an almost perpendicular cliff, a remnant also of the early quarry. The stone screenings, the sand and the crushed stone for the asphalt plant are dumped over this cliff and are reclaimed by two drag conveyors. The two conveyors converge at the boot of a small elevator serving the dryer. These conveyors, as well as all the others in the plant, were supplied by the Jeffrey Manufacturing Co., Columbus, Ohio.



Ready-mixed sanded lime mortar plant, Marble Cliff company

The feed ends of both conveyors are buried in the aggregate piles and access to the tail pulleys for lubrication, etc., is through a tunnel paralleling the cliff. Feeding the conveyors is done by simply removing steel-plate sections from the top of the conveyor at the toe of the piles, allowing the conveyors to run heavily loaded at times. The drags handling the sands work very satisfactorily, but on the coarser aggregate there is a decided tendency for the drags to ride the load or in other words to work towards the top of the stone. To prevent this, sprocket idlers with counterweights are used to keep the chains at the bottom of the housing. Each of the conveyors is driven by a 5-hp. General Electric motor through enclosed gear reducers.



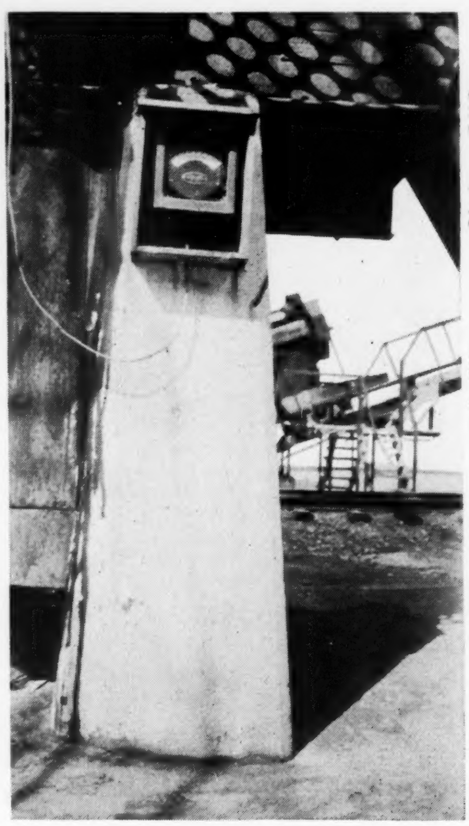
Pug mills for final mixing of hot asphalt mixture

The plant was designed by the Barber Asphalt Co., together with engineers of the Marble Cliff Quarries Co., and the dryer, mixers and steel frame work were supplied by the former company. The motors are all Allis-Chalmers, using Cutler-Hammer compensators, with General Electric push-button, remote-control switches.

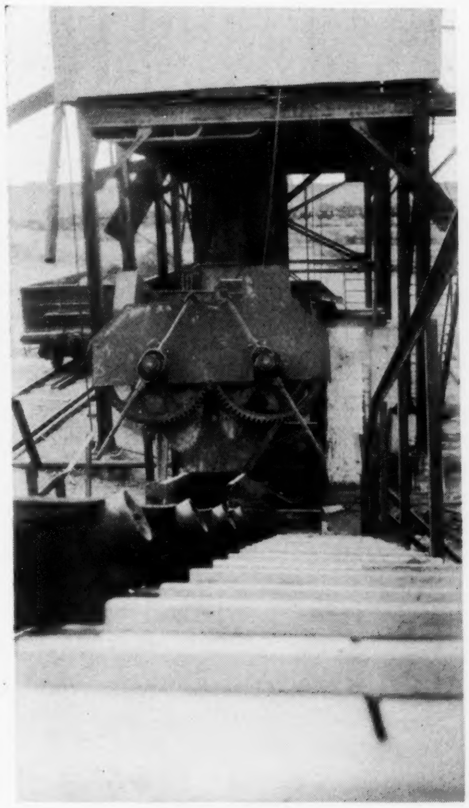
The 30-ft. Barber stone and sand dryer is oil-fired at the discharge end and is driven by a 30-hp. motor through an 8-strand "Tex-rope" drive and suitable gear reductions. The elevator feeding the dryer is driven from the dryer drum through enclosed gear reductions. The Clarage exhaust fan is direct-connected to a 20-hp. motor delivering the dust incidental to the dryer operations to a cyclone dust collector from which the dust is chuted back into the dryer discharge. A Brown indicating pyrometer controls the drying operation and for rock asphalt, the discharging rock has a temperature of 300 deg. F. For cut-back asphalt a lower temperature is used, so as not to cause undue evaporation of the lighter and more volatile asphalt used for this.

Separation of Dust

The dryer discharges to a third drag conveyor passing under the loading track that divides the plant. The dust from the collector is chuted to this conveyor, and the two products are elevated to the top of the plant and chuted to a small rotary screen setting on top of the stone storage bin. This screen is 8 ft. long, 2 ft. dia., and has one section of ¾-in. square wire cloth and a short section of ⅛ in., the oversize and the fines from this screen, which are rejected, falling to a bin. For production of cut-back asphalt the same elevator is used, but it discharges to a separate bin over which is mounted a Robins vibrating screen, which is used to separate dust from the cut-back asphalt stone in case there is an excess of



Indicating pyrometer on the stone and sand dryer



Control clutches for immersed screw conveyors at the Marble Cliffs asphalt plant

fines present. The elevator is driven by a 5-hp. motor through enclosed gear reductions.

For production of cut-back asphalt mixtures, 2-yd. capacity Jaeger mixers are used, so mounted that after the stone and hot asphalt has been added and mixed, the discharge is direct to gondolas or trucks below.

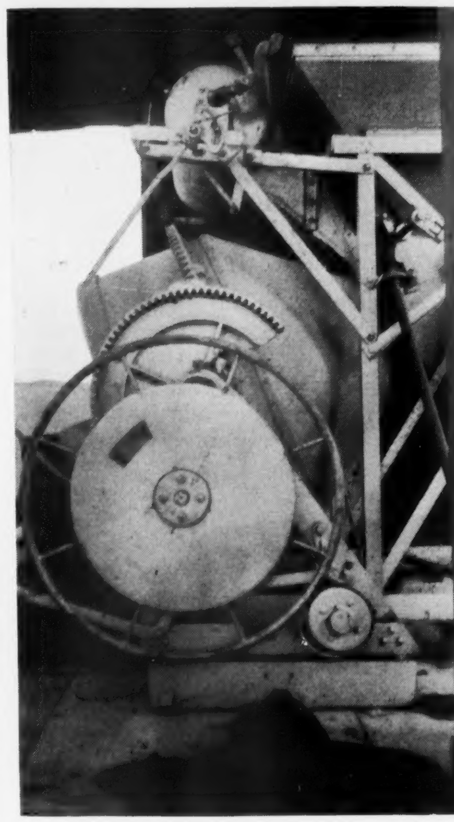
For "Scioto" rock asphalt, the trade name given the company's product, a certain amount of pulverized limestone is added, which is brought to the plant in sacks and dumped to the boot of a second elevator alongside the first one, and this elevator discharges to a steel bin alongside the stone storage bin previously mentioned. This elevator is driven by a 5-hp. motor through enclosed gear reductions and the rotary screen by the same sized motor and drive.

The pulverized limestone for rock asphalt mixtures is delivered to the weighing hopper by a short screw conveyor driven by a 5-hp. motor through a Foote gear reduction unit. After being weighed, the stone, dust and measured amount of hot asphalt drops to a 1-ton Iroquois type, Barber asphalt mixer driven by a 50-hp. motor through a James gear reduction unit. The hot asphalt then drops to two pug mills or short log washers for further mixing. The pug mills discharge to two short, parallel 18-in. screw conveyors immersed in water for cooling purposes. The asphalt is not only cooled to facilitate handling, but it adds necessary properties to the finished "Scioto" rock asphalt. The screws are inclined at an angle of about 20 deg. and discharge at the high end to a 24-in belt conveyor which in turn discharges to a short conveyor for loading cars below. The pug mills are driven by a 75-hp. motor, the screws by a 30-hp., and the main loading conveyor by a 5-hp. motor, all three drives being through enclosed gear reduction units. The short cross conveyor for loading is driven from the head pulley of the main conveyor.

The plant requires four men to operate to capacity. A. E. Shank is in charge.

Panel Tests of Lime Plaster

IN MARCH, 1922, a series of panels of lime plaster was erected at the Bureau of Standards, using several types of limes and intentionally including in the finish coat various impurities. The panels were allowed to age under ordinary laboratory conditions, and at the end of a year an inspection was made to determine the effect of the various impurities. The results of the first inspection were published by Emley and Berger in the *Journal of the American Ceramic Society*, Vol. 6, No. 9, September, 1923, under the title "Panel Tests of Lime Plaster."



One of the mixers for making cut-back asphalt at the Marble Cliffs company

A recent inspection, made nearly seven years after the panels were erected, shows that while the majority of the panels are apparently in the same condition as in 1923, certain ones have developed defects not noticeable at that time.

In the construction of the panels four sets of duplicates were made containing, respectively, hydrated lime, lime plus coarse impurity, lime plus medium impurity, and lime plus fine impurity.

For convenience in reference, the 1923 report on the panels which have undergone change since then is given below, together with comments on their condition in December, 1928.

Hydrate No. 5 *Plus Iron Carbonate*—(1923) The hydrate itself shows a few pops and cracks. The additions of iron carbonate seem to have no effect. (1928) Decided map cracking has developed on the panels containing lime without impurity. Numerous cracks and pops have occurred on the panels containing coarse and medium impurity; some have occurred on the panels containing fine impurity.

Hydrate No. 6 *Plus Quicklime*—(1923) The fine quicklime shows no noticeable effect; the medium shows a few additional pops, and the popping of the coarse particles is quite apparent. (1928) Numerous pops have developed on the panels containing fine quicklime.

Hydrate No. 10 *Plus Lime Burned During Hydration*—(1923) The coarse particles caused a few pops; with the medium size the pops are almost negligible; and the fine material caused no popping. (1928) Considerable cracking appears in the panels containing medium and fine burned lime.

Hydrate No. 11 *Plus Tannic Acid* (Fine)—(1923) The surface is badly checked and discolored. (1928) Several large pops are noticeable.

The results of this latter inspection indicate that while in the majority of cases defects which develop in lime plaster are noticeable at the end of a year, certain impurities may cause defects which are only apparent after several years' aging.—*Technical News Bulletin* of the U. S. Bureau of Standards.

Journal of the American Ceramic Society

THE American Ceramic Society has published the journal for May, 1929, in two volumes. The first volume deals with a variety of papers that are of interest to the ceramic industry. The second part is a bibliography compiled by R. D. Landrum and H. D. Carter and deals with published information on enamels.

Two hundred and thirty abstracts of articles which have appeared in the *Transactions* and the *Journal of the American Ceramic Society*, 250 United States patents dating back to 1872, with 115 British and 68 German patents relative to enamel are included in this valuable contribution.

All books on enameling are listed and a complete statement regarding each are made.

The bibliography is published at 20th and Northampton street, Easton, Penn. Price, $2. Foreign postage, 50 cents extra.

Screen Sizes for Concrete Aggregates

By Joseph A. Kitts
Consulting Concrete Technologist, Kitts and Tuthill, San Francisco, Calif.

Author's Note

A RECENT examination of screening plants showed that each plant had different screen sizes, all lacked a uniform ratio of sizes, and some plants had square hole screens where others had round holes.

The relative screening effects of round and square holes was recently determined for the first time by the author, and this discovery is checked by the work of the U. S. Bureau of Standards, the Portland Cement Association and the U. S. Bureau of Public Roads working under the auspices of Committee E-1 of the American Society for Testing Materials. The relation of round and square hole screens was not observed by them, however.

It is hoped that the suggestions of this article will be of service in the formulation of a greatly needed screening standard.

—The Author.

THE ADOPTION of standard screening sizes for concrete aggregates is an economic need of the day and is becoming increasingly important with the increasing use of concrete as a structural material.

It is the purpose of this article to offer some suggestions in the consideration of proper standards.

Round or Square Holes

The round hole is considered the most practical for both the scientific screens of the laboratory and for plant screens, excepting in the small holes of ¼-in. or less.

Relative Screening Effects of Round and Square Holes

Round and square holes, of the same average diameter, have the same practical screening effect. If the side of the square is taken as 1 in., the average diameter of the opening is $(1\div1.4142)/2=1.207$ in., and the corresponding round hole should be 1.2 in. in diameter (dropping the 0.007 as of no practical consequence).

Ratio of Sizes

There should be a uniform ratio of successive sizes of screens as with such a uniform ratio the fineness modulus, a function of the average diameter of particles, is readily obtained by taking the sum of the proportions retained on such a system of screen sizes. This is of considerable practical and scientific importance in the reproportioning or two or more aggregates for a concrete mix.

A ratio of two (2) appears to be the most practical one excepting that, in the larger sizes, half sizes are often necessary as a measure of economy in using the largest practical maximum size. The ratio between the half and whole sizes would then be the square root of two ($\sqrt{2}$), or 1.4142.

The Standard Laboratory Screens

The standard laboratory screens for concrete aggregate are of the square hole type and are given as follows with the equivalent round hole sizes:

	Standard screen, side of square hole in inches	Equivalent round hole diameter in inches
	3	3.6
	2*	2.4
	1.5	1.8
	1.0*	1.2
	0.75	0.9
	0.375	0.45
No. 4	0.187	Use square
8	0.0937	Use square
16	0.0469	Use square
30	0.0232	Use square
50	0.0117	Use square
100	0.0059	Use square

*Half sizes.

There is a trend of thought for the round hole screen as the standard in preference to the square hole, and there is no important reason why the standard may not be changed both in the shape and size bases.

Suggested Sizes

A uniform system of sizes, in the ratio of 2 for whole sizes and 1.414 between whole and half sizes, corresponding as nearly as possible to general plant practice, is as follows:

Round-hole screen diameter, inches, whole size	half size	Equivalent square-hole screen side of square, inches, whole size	half size
12.0		10.0	
	8.5		7.07
6.0		5.0	
	4.25		3.535
3.0		2.5	
	2.125		1.767
1.5		1.25	
	1.062		0.883
0.75		0.625	
	0.531		0.442
0.375		0.312	
	0.266		0.221
0.187		0.156	
Use square		0.078	
Use square		0.0395	
Use square		0.0197	
Use square		0.0098	
Use square		0.0049	
Use square		0.0024	

Looking to the eventuality of an international standard, the following sizes are suggested in the metric system:

Round hole diameter, cm., whole	half	Square hole side of square, cm., whole	half
24		20	
	17		14
12		10	
	8.5		7
6		5	
	4.25		3.5
3		2.5	
	2.125		1.75
1.5		1.25	
	1.062		0.875
0.75		0.625	

Number of Sizes for Concrete

The number of sizes of aggregate used in concrete is increasing from two to four or more and the economical number is about as follows, depending upon the maximum size used:

Maximum size	Number of sizes
¼-in.	1 or 2
⅜-in.	2 or 3
¾-in.	3 or 4
1 -in.	3 or 4
1½-in.	3 or 4
2 -in.	3 or 4
3 -in.	4 or 5
4¼-in.	4 or 5
6 -in.	4 to 6
8½-in.	4 to 6
12 -in.	4 to 6

In the light of the present knowledge of concrete mixtures, six sizes of aggregates would appear to be the economical limit for maximum sizes exceeding 3 in. The maximum size of aggregate that has been handled practically and economically is that of the Exchequer dam, and was 10-in. round hole. As the mixing and placing plant was designed for 7-in. ring maximum it would appear that 12-in. maximum may be provided for in the future.

Proceedings of the American Road Builders' Association

THE AMERICAN ROAD BUILDERS' ASSOCIATION has the proceedings of the 26th annual convention held at Cleveland, Ohio, this year ready for distribution. The volume can be secured by addressing the association in the National Press Building, Washington, D. C. The price is $5.00.

The paper by Duff A. Abrams, director of research of the International Cement Corp., on the use of high early strength cement in highway work, and several other papers on gravel, chert and shale roads are of interest to Rock Products readers.

Relation of Chemical Test Methods and Sulphate Resistance of Different Brands of Portland Cement

By George W. Burke
Engineering Experiment Station, Iowa State College, Ames, Iowa

IT HAS BEEN DEMONSTRATED by Miller[1] that concrete made from different brands of portland cement show variable resistance toward sulphate-bearing waters. He also showed that the chemical analyses and the ordinary physical tests as usually applied to cement did not foretell which brands would best withstand sulphate attack.

In order to determine the sulphate resistance of the concrete made from 30 different brands of portland cement Miller made specimens in the form of 2 x 4-in. cylinders that he immersed in 1% sodium-sulphate solution. He compared the normal strength of the specimens at the end of six months, one year and two years, and determined the relative sulphate resistance by comparison of the values obtained. Such a method, though reliable, consumes considerable time. For this reason a method that could be accomplished in a relatively short time would be most desirable.

Through the courtesy of D. G. Miller, fifteen of the samples that were employed in the work just described were obtained. With these samples of known sulphate resistance various attempts were made to develop a test that could be quickly and easily completed in the laboratory.

Hydrolysis

Various investigators have demonstrated that portland cement will give up some of its lime in the form of $Ca(OH)_2$ after prolonged treatment with water. Bates, Phillips and Wig[2] dissolved about 50% of the lime from cement. Some Canadian investigators[3] dissolved 72% by prolonged water treatment. Lerch and Bogue[4] found that the constituents of portland cement, particularly the silicates, liberated nearly all of their lime when treated with water. They found that the $3CaO{\cdot}SiO_2$ and $3CaO{\cdot}Al_2O_3$ gave up more lime than any of the others and of the two $3CaO{\cdot}SiO_2$ the greater amount. Next in order came beta $2CaO{\cdot}SiO_2$, $5CaO{\cdot}3Al_2O_3$, gamma $2CaO{\cdot}SiO_2$ and lastly $2CaO{\cdot}Fe_2O_3$.

[1]Miller, D. G.; "Resistance of Portland Cement Concrete to the Action of Sulphate Waters as Influenced by the Cement." *Journal Series Paper No. 625*, University of Minnesota.
[2]Bates, Phillips and Wig. *Tech. Paper* No. 12, U. S. Bureau of Standards.
[3]Thorwaldson, Harris and Wolachow. *J. Ind. Eng. Chem.* 17, No. 5, 467 (1925).
[4]Lerch and Bogue. *J. Phy. Chem.* 31, No. 11. 1627-46 (1927).

It has been pointed out that the lime liberated is susceptible to reaction with the alkali sulphates[5]. In consideration of these two parts it seems that the rate at which cement samples give up their lime to water would be a measure of the relative chemical attack that would be affected by sulphate solutions and, therefore, an indication of the sulphate resistance of concrete made from the various brands.

Fig. 1 represents the relation of the several different brands of cement in this respect. A comparison of the amount of lime liberated from the various brands with the findings of Miller is given in Table 1.

These data indicate that the various cement samples behaved quite differently in the amounts of lime liberated by water treatment. Although the composition of portland cement is quite uniform from the analytical standpoint, and the process of manufacture is well standardized, it is apparent from the results of this experiment that the cements represented by the above samples are constituted quite differently in some respects. Fig. 1 points out that samples 33 and 41 behaved almost alike and gave up the greatest amount of lime while 37 liberated the least. It would seem reasonable to judge, therefore, that samples 33 and 41 were higher in $3CaO{\cdot}SiO_2$ and $3CaO{\cdot}Al_2O_3$ than sample 37.

[5]Burke. *Bulletin* 74. Eng. Exp. Sta. Iowa State College, 1925.

Miller found the sulphate resistance of 33 to be the least and 41 to be the greatest. If the rate and extent of hydrolysis did indicate similarity in proportion of constituents, it appears that such a factor does not influence the sulphate resistance of the samples. Sample 37 had a sulphate resistance about equivalent to 41 yet the extent of hydrolysis was quite the reverse. This would further point out that if the rate and extent of hydrolysis was dependent upon the nature of the constituents of the cement that sulphate resistance, in some instances at least, was not dependent upon the chemical constitution of the cement. The data demonstrate that there is not any direct relationship, without exception, between sulphate resistance and relative water solubility or extent of hydrolysis.

It should be noted, however, that those samples having the greatest solubility, namely: 33, 41, 42, 35, 34 and 40, number 33 excepted, are the ones that had the greatest per cent normal strength after two

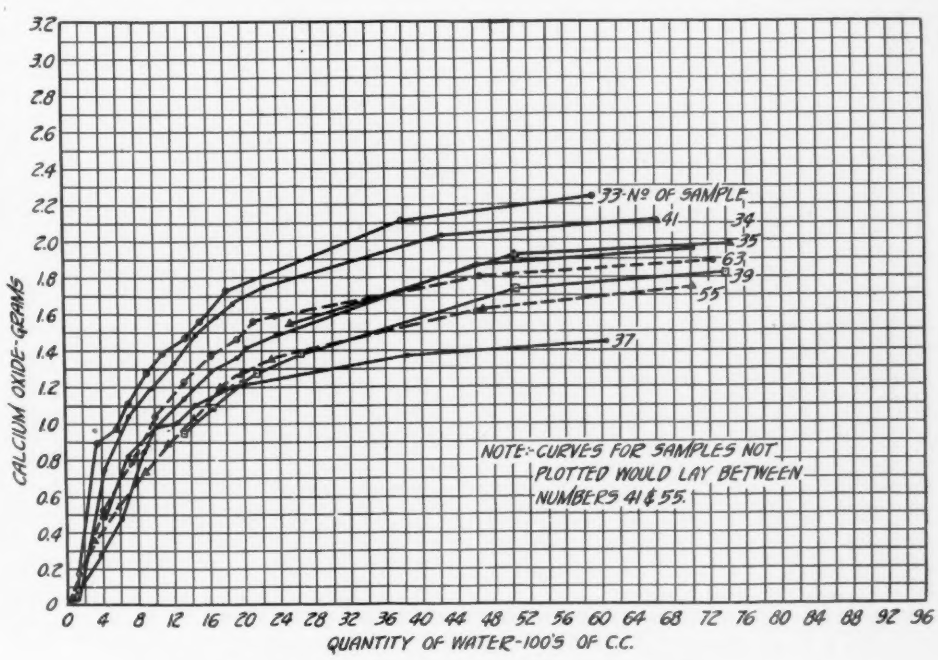


Fig. 1. Lime dissolved from cement samples

years in sulphate solution. Due to exceptions, especially samples 33 and 37, it would be hazardous to use such a test to accurately select those cements that would produce the most resistant concrete. It was stated above that one would expect the greatest amount of chemical reaction in sulphate solution upon those samples which liberated the greatest amount of lime. This is either not true or that the greatest extent of chemical reaction is not responsible for the quickest failures.

Relative Chemical Reaction

To settle the question raised above samples of the raw cement were shaken in bottles with like amounts of 1% sodium-sulphate solution. The solutions were periodically withdrawn, renewed and analyzed. The results are given in Table 2. In a similar manner samples of the cements in the form of blocks (cured 7 days in moist closet), 1 in. square and ½ in. thick were suspended in wide mouthed bottles and tested for the relative amount of chemical reaction caused by sulphate solution. The results are summarized in Table 2.

TABLE 1—RELATION OF WATER SOLUBILITY OF CEMENTS AND THE RELATIVE SULPHATE RESISTANCE OF THEIR CONCRETE

Cement No.	Per cent lime dissolved by water†	Cement No.	Life in weeks**	Per cent normal strength after 2 yr. in. 1% Na_2SO_4**	Depth of settled precipitate, mm.
33	75	40	210	89	14
41	69	41	165	73	17
42	68	42	165	66	14
35	65	34	165	71	14
34	65	35	150	62	16
40	63	37	115	39	26
63	61	39	88	31	17
100	60	55	73	25	20
103	60	103	72	21	17
39	59	63	49	0	26
55	59	60	42	0	48
37	49	33	36	0	31
....	....	62	32	0	23
....	....	104	30	0	20
....	....	100	27	0	41

**After Miller.

†Samples 60, 62, 100 increased in volume to entirely fill the bottles, preventing further test.

It has been demonstrated that when cement in the finely divided state is exposed to sodium-sulphate solution that reactions take place as follows:

(1) $CaO \text{ (of cement)} + H_2O = Ca(OH)_2$

(2) $Ca(OH)_2 + Na_2SO_4 + 2H_2O = CaSO_4{\cdot}2H_2O + 2NaOH$

The sodium sulphate solution reacts with the liberated lime to produce crystalline calcium sulphate, which deposits itself on the cement and caustic soda is liberated which remains in solution. Calcium sulphate is not wholly insoluble, therefore some of it goes into solution. Due to this fact the total amount of this material produced will include that in the solid state that has been precipitated on the cement and that in solution.

The results in Table 2 are of such nature that it is impossible to correlate them with those of Miller or the solubility values obtained. Again, the results on the cement blocks are not of the same order of magnitude as those obtained with the raw cement nor do they agree with the water solubility values. In some cases it was true that those cements that were found to be the most resistant by Miller showed the least chemical action.

During the treatment of the neat cement blocks, samples 33, 62, 104, 100 and 60 very quickly showed signs of disintegration, in the order named, in the form of cracks at the corners and edges. If the extent of chemical reaction was wholly responsible for physical disintegration it would seem that the magnitude of attack would be in the order of physical defects as indicated above. This is not the case, which would indicate that physical disintegration is not wholly dependent on the extent of chemical attack. The experiment further points out that the amount of chemical attack is dependent on the water solubility of the samples.

TABLE 2—RELATIVE CHEMICAL ACTIVITY OF THE VARIOUS CEMENT SAMPLES

Cement	Total $CaSO_4$ made by raw cement	Calcium sulphate ($CaSO_4$) precipitated on blocks and total made							
		3-day period		3-week period		3-week period		Total $CaSO_4$ ppt. on blocks	Total $CaSO_4$ made
		ppt.	made	ppt.	made	ppt.	made		
33	0.6882	0.1608	0.3072	0.1921	0.3247	0.1741	0.3518	0.5270	0.9837
34	0.6542	0.2659	0.4912	0.1476	0.2746	0.1129	0.2309	0.5264	0.9967
35	0.6582	0.2579	0.4786	0.1440	0.2171	0.1421	0.2329	0.5440	0.9286
37	0.6381	0.1396	0.2659	0.2659	0.1421	0.1989	0.0857	0.1809	0.6457
39	0.6602	0.2190	0.3778	0.1248	0.1600	0.1370	0.2288	0.4808	0.7666
40	0.6401	0.1991	0.3361	0.1313	0.1828	0.1277	0.1860	0.5132	0.7349
41	0.6381	0.1979	0.3737	0.1262	0.2058	0.0949	0.1595	0.4190	0.7390
42	0.5797	0.3190	0.5603	0.1484	0.2295	0.1052	0.1795	0.5726	0.9693
55	0.6099	0.2533	0.4337	0.1437	0.1923	0.1211	0.1735	0.5893	0.7995
60	0.5797	0.2170	0.3612	0.1151	0.1853	0.0787	0.1627	0.5174	0.7092
62	0.7146	0.1915	0.3515	0.2253	0.3011	0.1937	0.2724	0.7179	0.9250
63	0.6602	0.1775	0.3464	0.1804	0.2372	0.1309	0.2334	0.4888	0.8978
100	0.6300	0.1586	0.2914	0.1440	0.2520	0.1328	0.2377	0.4354	0.7811
103	0.6220	0.2766	0.4907	0.1542	0.2584	0.1573	0.2704	0.5881	1.0196
104	0.6461	0.2113	0.4072	0.2314	0.3341	0.1362	0.2853	0.5789	1.0266

In connection with the chemical test on the raw cement samples it was observed that the samples had become flocculated so much that the apparent volume of the various samples were all different. The relative volume of the different samples are listed in Table 1. It is interesting to note that volumes increased almost in exact accordance as Miller found the sulphate resistance to decrease.

Summary and Conclusions

1. Various brands of portland cement hydrolyze and liberate lime at different rates when treated with an excess of water and the rate and extent of the lime liberated does not specifically indicate the sulphate resistance of cement or the extent of chemical reaction in sulphate solutions.

2. The relative rate and extent of chemical reaction as caused by sulphate solution does not truly indicate the relative resistance to sulphate waters.

3. It is probable that a general idea of the sulphate resistance of various brands of portland cement can be quickly ascertained by submitting briquets, all made in the same manner, to solutions of sodium sulphate of 10-15% concentration.

Sulphoaluminates of Calcium

BECAUSE of the widespread interest in the action of sulphate waters on concrete, the identification of calcium sulphoaluminates is of interest to cement chemists, this compound being one formed under some conditions. It has been ascribed by some investigators to be responsible for certain expansion effects observed at times in concrete which is exposed to sea water and to alkali soil waters. The exact nature of this compound and its condition of formation and stability have not been adequately treated.

An investigation concerned with the formation, properties and conditions of equilibrium of such compounds as may be obtained by the interaction of CaO, Al_2O_3, and SO_3 in aqueous solutions with especial reference to the conditions under which these compounds may be formed in concrete was carried out at the U. S. Bureau of Standards and the findings incorporated in research paper No. 54. In addition to the above, attempts were made to obtain a compound of lime, alumina, silica, and sulphate.

Federal Trade Commission Rescinds Rule on Secret Violations

Clandestine Offenses Had Been Classified as Unfair Competition Under Regulation — Decision Removes Vital Element from Rules of Trade Practice Conferences

THE FEDERAL TRADE COMMISSION, it was announced May 29, has revoked its so-called "clandestine" rule of trade practice conferences, which held that any secret violation of trade practice agreements reached by the industry and passed on by the commission amounted to an unfair method of competition. The rule was adopted by the commission last October by a 3 to 2 vote and has been applied in the case of trade practice agreements drawn up since that date under the auspices of the commission.

The commission's announcement of its action did not state its reasons for revoking the rule, but the chairman of the commission, Edgar A. McCulloch, who dissented from the majority, made public a memorandum in which he asserted that the commission was wholly within its rights in formulating the rule and had acted wholly within the meaning of the Federal Trade Commission Act and the intention of Congress.

Elimination of Secrecy

The policy of the commission, Chairman McCulloch explained, does not involve the coercion of specific performance of contracts which naturally is within the exclusive jurisdiction of courts of equity. The sole concern of the commission, he added, is elimination of hurtful secrecy in the violation of a lawful compact between competitors.

"The wrong done by the act of secrecy," continued Mr. McCulloch, "need not be an actionable one in order for the jurisdiction of the commission to be exercised, for most of the cases coming before us fail to include the essential elements of a right of action in court for redress.

"In fact the main purpose of the lawmakers was to create the restraint of non-actionable wrongs. The activities of the commission were intended to conserve the public interest, not merely to redress private wrongs."

The full text of the commission's statement follows:

"The Federal Trade Commission has reconsidered and rescinded the so-called 'clandestine' trade practice conference rule adopted last October.

"The rule in question was as follows:

" 'That the clandestine violation of any of said resolutions, those accepted by the Federal Trade Commission merely as expressions of the industry as well as those approved by said commission, shall be deemed unfair methods of competition.' "

The full text of Chairman McCulloch's dissenting memorandum follows:

Adoption of the so-called "Clandestine Rule" was first declared by the commission in approval of a resolution of the Trade Practice Conference of the cottonseed mill industry, but subsequently the commission declared, as a settled policy, that the rule would be applied to violations of all trade practice conference resolutions, whether so resolved by a conference or not, hence the rule may more properly be termed a policy of the commission.

That declaration of policy was made in what has come to be known as the "Rawn Letter" relating to the Trade Practice Conference in the millwork industry, the declaration being "that the clandestine violation of any Group II resolutions by one who had subscribed thereto in consideration of the like subscription by other members in this industry is in and of itself an unfair method of competition, calling for action by the commission."

It is readily conceded by all who have given consideration to the subject that what constitutes an "unfair method of competition" in the meaning of the statute is a question of law to be finally decided by the court of last resort, and that units of an industry cannot, by conference resolution, make a practice unlawful which is not under the statute as interpreted by the court, nor can it make a practice lawful which is not so under the court's interpretation. Nor can the commission do so by approval of a conference rule or otherwise. The law can only be enacted by the Congress and is to be finally interpreted by the court. So that phase of the discussion may forthwith be dismissed.

Commission Must Decide on Legality of Practices

But the commission must necessarily, in the first instance, open the trail by deciding whether or not a given practice is lawful or unlawful so as to give the court an opportunity to adjudicate the question. In doing so, the commission, though merely an administrative and fact-finding body, acts in a quasi-judicial capacity without appearing to exalt itself into the realm of the judicial branch of the government. If the commission is to function at all it must, in the first instance, decide such questions, and it should not hesitate in fear of doubts lurking in the mists which will ultimately vanish when the courts decide the questions involved.

In the beginning of the activities of the commission there were no guiding decisions of the courts; and even now, after experiences of nearly 15 years, trade practices are constantly reported which do not directly come within former court decisions and yet the commission ventures to determine whether those practices are lawful or unlawful. The commission was clearly, therefore, within the range of its proper functions in determining that secret violations of trade practice rules—violations by signatories to those rules—constitute "unfair methods of competition."

Secrecy Is Essential in Violating Rules

It will be noted that secrecy is the essential element in the violation of mutually established rules, which is held to constitute unfairness—not open violations nor violations by those who have not agreed to abide by the rules.

A definition of the term "unfair methods of competition," stated by the supreme court in the Gratz case (253 U. S. 421) and the only one stated by that court is as follows:

"They are clearly inapplicable to practices never heretofore regarded as opposed to good morals because characterized by deception, bad faith, fraud or oppression, or as against public policy because of their dangerous tendency to hinder competition or create monopoly."

Stated conversely, this definition means that practices "characterized by deception, bad faith, fraud or oppression" have been "heretofore regarded as opposed to good morals"—and do constitute "unfair methods of competition."

Secret violation of a lawful compact between competitors in trade would clearly seem to constitute "deception, fraud and bad faith," and to be "opposed to good morals." And it may also result in "tendency to hinder competition."

It has been suggested in some quarters that secret violation of a compact is "not

good morals," and yet it "is not opposed to good morals." The writer here is unconvinced that the distinction thus stated is sound, for a practice which is not within the realm of good morals is "opposed to good morals." He that is not for good morals is against good morals. It may fairly be assumed that the supreme court used the words "good morals" not in a technical, but in a popular sense for the general conception of good morals must be and is the true test. Morality has been defined to be conformity or nonconformity to accepted rules of right—and the courts can find no safer guide than that definition.

Interest of Public Must Be Involved

The policy of the commission does not involve the coercion of specific performance of contracts, which is within the exclusive jurisdiction of courts of equity—its sole concern is with the elimination of hurtful secrecy in violation of a lawful compact between competitors. The wrong done by the act of secrecy need not be an actionable one in order for the jurisdiction of the commission to be exercised, for most of the cases coming before us fail to include the essential elements of a right of action in the courts for redress. In fact the main purpose of the lawmakers was to create a means for the restraint of nonactionable wrongs. The activities of the commission were intended to conserve the public interest, not merely to redress private wrongs.

Difficulties will doubtless be found in the enforcement of this policy of the commission as to all of the rules which may be adopted by the various industries. The commission does not pledge itself to restrain secret violations of all of such rules, regardless of the facts in a given case and regardless of the effect upon the public. It merely declares that secret violations constitute "unfair methods of competition." Before the corrective power of the commission can be involked in a given case it must appear that the public interest is involved, even though injury to a competitor may result.

Some of the rules, those, for instance, which relate only to methods of accounting, may not be found to effect the interest of the purchasing public—some of the rules may be such that a violation would necessarily be open, not secret—and there can be no enforcement. But there will be some found, the secret violation of which will be both hurtful to competition and affecting the interest of the purchasing public. Those violations can and should be restrained by order of the commission after due trial.

No fear need be entertained that the commission, by the declaration of policy in advance, will have denied to the offender a fair trial upon the facts of his particular case. The writer is of the opinion that the commission's policy of preventing secret violations of trade conference rules is not invalid and that it should not be abandoned. Notwithstanding the difficulties which may arise in enforcing the policy, it is not without value to industries in which there is a desire to establish, through conference rules, sound business practices and to eliminate unwholesome ones. The policy is at least an adventure which can, if pursued, result in no harm to business interests, and on the contrary might be helpful.

I dissent from the action of the majority of the commission repudiating this policy.

Senate to Hold Open Hearings on Tariff

THE SENATE FINANCE COMMITTEE on June 3 agreed to hold open hearings on tariff schedules from June 12 to July 10 and the chairman of the committee, Senator Smoot (Rep.), of Utah, expressed the opinion that the bill (H. R. 2667) will be in shape to be reported to the Senate early in August.

Senator Smoot announced that the committee, during an executive session, had adopted a motion made by him "that hearings on the tariff bill (H. R. 2667) be held in open session by subcommittees of the finance committee under the direction of the committee; that each subcommittee consist of five members, three majority members to be designated by the chairman and two minority members to be designated by the ranking minority member [Senator Simmons (Dem.), of North Carolina] of the committee, and that such hearings shall not extend beyond July 10."

The various schedules in the bill will be allotted to subcommittees, Senator Smoot said, but the sections containing the administrative provisions and the proposals regarding valuation will be reserved for the consideration of the full committee.

Senator Watson (Rep.), of Indiana, majority leader in the Senate and a member of the finance committee, expressed the view that the Senate will not meet after the contemplated recess until about the middle of September. He also said that the question of fixing a date for final action on the bill is still to be determined and that he does not regard it as "impossible" to obtain such an agreement.

Senator Jones (Rep.), of Washington, assistant majority leader, expressed himself as satisfied with the plan announced by the finance committee. He added that he does not see how it will be possible, under the Senate rules, to fix a date for a final vote except by unanimous consent.

Senator Simmons, discussing the proposal for subcommittee hearings, declared that that idea is acceptable to the minority members of the committee.

All of the senators who expressed an opinion on the subject agreed that the bill should be enacted into law during the present special session of Congress.

Monolith Mid-West Cement Plant to Be Dedicated June 22

PROBABLY as unique an undertaking as has ever before been attempted by a Los Angeles, Calif., industry was disclosed in the announcement that a special Union Pacific train will leave that city on June 20 carrying officers, members, shareholders and friends of the Monolith Portland Cement Co. and the Monolith Portland Midwest Co. to the formal opening on June 22 of the Midwest company's new $2,000,000 plant at Laramie, Wyo.

The train is scheduled to leave the Union Station, Los Angeles, at 11 a. m., arriving at Salt Lake City on June 20 at 12:15 p. m., where the Monolith guests will have an opportunity to inspect places of interest until 6 p. m., when the train will depart for Laramie. Arriving at Laramie at 8 a. m., June 22, the visitors will be guests of Laramie citizens for the day during which the huge cement mill and quarry will be inspected. The train will depart from Laramie at 3:30 a. m. June 23, arriving at Denver at 7:30 a. m., of the same day. A sight-seeing tour has been arranged at Denver following which the visitors will leave at 3:30 p. m. for Cheyenne, Wyo., arriving there at 7 p. m. The train will depart from that city at 10:10 p. m., and will arrive back in Los Angeles at 2:30 p. m., June 25.

The schedule has been arranged, it was pointed out, so that the Monolith guests will pass through the rich agricultural district of Northern Colorado and other sections during the daytime. It is expected that at least 100 will make the trip. Dining service during the trip will be provided without charge.

Tariff Changes Affect Several Rock Products

THE MODIFIED tariff bill as passed by the House of Representatives provides increased schedules for mica, talc, monumental and paving granite, building stone (freestone, limestone, etc.) and travertine. No changes were made in the cement, lime and limestone schedules and likewise no changes in the free list so far as crushed stone, sand and gravel were concerned.

Batesville Plant Starts Crushing

THE new crushing plant at Limedale, Ark., has been put into operation at the Batesville White Lime Co.'s property. A large storage bin will be used for crushed stone.

The plant will have a capacity of 600 tons per day. For the next few years a considerable part of its product will be used for ballast on the White River division of the Missouri Pacific railroad. The plant also will distribute ground agricultural limestone.

The Federal Laboratory for Testing Cement and Training Men in Work Is Established

Calibration of Devices Used in Determinations Also Is Planned by Bureau of Standards

THE BUREAU OF STANDARDS has established a reference laboratory for testing portland cement, for calibration of machines and instruments used in cement testing and for training men for commercial cement testing laboratories, the Secretary of Commerce, Robert P. Lamont, announced May 24. The full text of the statement follows:

The new laboratory is supported jointly by the American Society for Testing Materials and the federal government. Its work is under the immediate supervision of P. H. Bates, chief of the clay and silicate products division of the Bureau of Standards.

The establishment of this new laboratory is the outgrowth of a plan originally formulated by the cement committee of the American Society for Testing Materials. Frederick W. Kelley, president of the North American Cement Corp., as spokesman of the cement industry, addressed a letter to Mr. Bates, chairman of the cement committee of the A. S. T. M., on September 15, 1928, calling attention to the need of such a laboratory.

In this letter Mr. Kelley said:

"There are produced annually in the United States about 170,000,000 bbl. of portland cement. Substantially all this cement is made to conform to the standard specifications for portland cement which have been adopted by the American Society for Testing Materials by the U. S. government departments and by the principal users of portland cement in the United States.

"It is necessary that all this cement be tested to make certain that it does conform with the standard specifications, and it is important that such tests be made to insure the integrity of the structures in which the cement is used. It is of vital importance to both the user and the manufacturer of cement that the tests be accurate, and that the results of tests on the same sample by two laboratories be the same.

"There are in the United States today probably 300 cement testing laboratories. Several series of carefully conducted tests have shown a lamentable lack of concordance in the results obtained even among the best of them. Differences of 100% in results are not unusual. This introduces a most undesirable element of uncertainty into both the technical and the commercial ends of the cement industry and is interfering with its development.

"Printed information and instructions have been made available to all interested in an unsuccessful effort to secure better results. It is believed that personal inspection and instruction are needed to secure a proper appreciation by all laboratories of the importance of machine calibration and exact compliance with specified conditions and methods. There is today no recognized authority equipped to give this inspection, instruction and advice.

"We propose to establish at the Bureau of Standards at Washington a fellowship to be known as 'Reference Laboratory for Standard Cement Testing' and, under this fellowship, establish a laboratory with apparatus and personnel capable of making tests of portland cement in strict conformance with the specifications. This laboratory staff is to be prepared to instruct on proper methods of making tests and maintaining testing equipment, also to calibrate all equipment submitted by laboratories as purchasers or by manufacturers of said equipment."

Five Experts in Charge

As the result of this letter the details were worked out for the establishment of the desired laboratory under the Bureau of Standards research associate plan. The staff will consist of five experts, three of whom are already at work. This laboratory staff is prepared to give instruction on established methods of testing, and the proper maintenance of testing equipment and will also calibrate such equipment submitted by purchasers or manufacturers.

Tests will be made of portland cement in strict conformance with the standard specifications and tests of the American Society for Testing Materials. For the present, it is planned to confine the work to physical testing.

The instruction to be given by the laboratory staff will be of two kinds, one in the laboratory in Washington and the other in the field.

One: In Washington detailed instruction will be given in the making of test specimens and in the methods of testing. Instruction will also be given in the maintenance of testing equipment and in checking the calibration ot equipment.

Two: In the field the instruction will consist principally of criticisms of methods and conditions noted in each laboratory visited, and suggestions will be given for improving them. At the same time testing equipment in the laboratory visited will be calibrated where possible and instruction given in proper maintenance of equipment.

Service on Application

The service will be available upon application only and will be rendered as nearly as possible in the order in which applications are received. Instruction in Washington may be expected to occupy two or more weeks, depending upon the aptitude of the men sent for training.

The schedule of the laboratory representatives giving instruction in the field must obviously be arranged by routes to avoid unnecessary traveling. A couple of days only can be allotted to each laboratory on each visit.

Application for service should be made to Cement Reference Laboratory, care of Bureau of Standards, Washington, D. C.

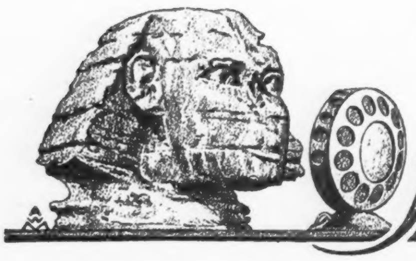
It is the intention of the laboratory to issue certificates covering machines tested by it. These are all to be issued from Washington, and the fees charged for these services will be in accordance with the schedules for similar work now in force at the bureau. The money obtained will be deposited in the United States Treasury and will not be available for expenditure.

A special committee of the main committee on cement of the American Society for Testing Materials has been appointed to co-operate with the Bureau of Standards in conducting the work of the reference laboratory.

New Costa Rica Crushing Plant to Use American Equipment

A COMPLETLY MODERN crushing plant will soon start producing crushed limestone to be used in the construction of roads and bridges in and around San Jose, Costa Rica. Machinery for this plant was built by the Smith Engineering Works of Milwaukee, Wis., for the Simmons Construction Corporation of Charlotte, N. C., to whom the Costa Rican government has awarded a contract calling for the expenditure of $4,000,000.

The plant, which is entirely equipped with Telsmith machinery and requires about 150 hp. to operate, will commence operations within a short time. The three solid carloads of machinery have already been shipped by the Smith Engineering Works to San Jose, Costa Rica via New York City and Port Limon. The plant's equipment consists of the following units: One No. 13-A Telsmith primary breaker; one No. 7 Telsmith back-geared belt elevator 74 ft. 0 in. long, with belt; one 60 in. x 18 ft. 0-in. Telsmith heavy duty screen; one No. 40 Telsmith reduction crusher; four 20 in. x 18-in. Telsmith "Siquad" bin gates with carloading chutes; four 20 in. x 20-in. Telsmitn duplex bottom bin gates.

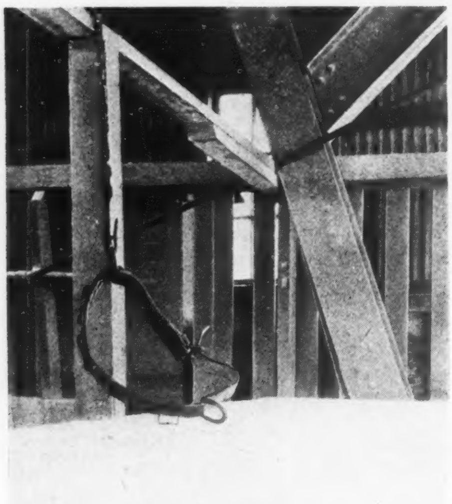


Hints and Helps for Superintendents

Safety Belt at a Cement Plant

SAFETY measures and appliances do not necessarily have to be complicated; in fact, the simpler they are the more useful they will prove.

At the portland cement plant of the Cuban Portland Cement Co., Mariel, Cuba, the limestone is crushed in a 36-in. Superior



This belt must always be worn when working over the crusher

McCully gyratory crusher. In the event that the crusher becomes clogged or the operator has to work over the crusher, for any reason, the safety rules require that he put on a safety belt provided for that purpose before attempting any work of this nature.

The safety belt is a regular linesman safety belt provided with loops and other conveniences for holding tools and is attached to the building framework by a ¼-in. chain of suitable length to allow full working range without danger to the workman.

Safety rules regarding the belt are conspicuously posted

Protecting Electric Shovel Cables

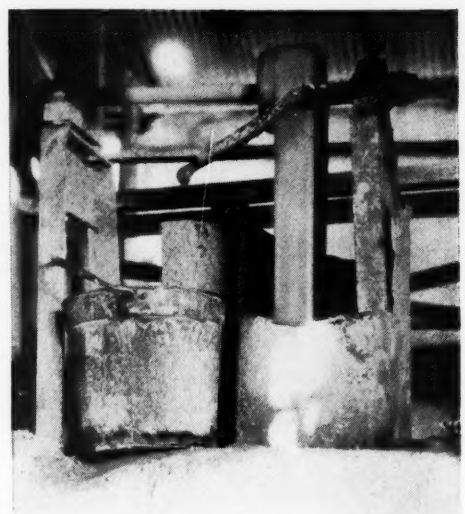
AT the Marble Cliff quarries near Columbus, Ohio, the quarry operations are conducted over an area not of acres but of square miles in extent. At one end of the pit steam locomotives are used for transportion, while at the other end is used the Woodford haulage system—a system where each car is individually motored but all the cars are controlled from strategically located towers by one operator in each tower. At this operation there are four towers, each tower controlling a section of track, roughly one-quarter of a mile long, that is subdivided into six smaller track sections separately controlled, so that cars on the different subsections can be stopped, started, retarded in speed or accelerated by the operator in the tower.

Electric cables to connect up the various track sections with their control stations are fastened to short posts and strung along the track sections. When one sees these cables cared for in this manner the thought immediately occurs that if cables for this use are worth caring for, why should not a similar method be used for increasing the life of electric shovel cables by keeping them off the ground, up where they can be seen and not where any chance truck, wagon or tractor can run over them, unwittingly, perhaps, but doing real damage, nevertheless?

Slurry Sampler

AT a southern cement plant the slurry is delivered to a series of tanks by a screw conveyor. While the tanks are being filled it is necessary to take a sample at frequent intervals so that by the time the basin is full the analysis as indicated by the composite results will be available.

The device used consists of a 1½-in. belt supported at the top by a free pulley and driven at the bottom by the end stub of the shaft of the slurry conveyor. This belt is so placed that it is always in contact with the slurry flow. At one point on the outside of the belt there is riveted a small section of belting about ½-in. long and the width of the belt, so as to make a bump or raised surface at that point. As the belt comes out of the slurry and over the head pulley it just clears a metal scraper, but the obstruction riveted to the belt scrapes as it passes by. The scraper removes about a teaspoonful of slurry every time the belt makes a complete revolution and this material drops into a pail from which it is later removed for analysis at the company laboratory.

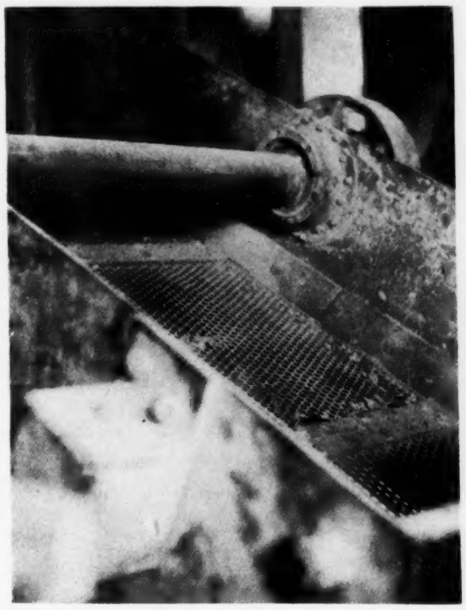


Sampler which gives a composite sample of slurry for analysis

Electric cable strung on short posts following the quarry tracks

Old Rotary Screen Plate Used in Vibrating Screen

AN unusual way of using up old punched plate screening was inaugurated by the Lima Stone Co., of Lima, Ohio, when the company changed its sizing equipment from revolving screens to vibrators recently. The punched plates were flattened out and fitted into the new vibrators as shown in the illustration. In the two single-deck vibrating screens into which the plate screens have been fitted they are reported to have functioned entirely satisfactorily. The single-deck screens have been installed for one complete season, but the balance of the sizing equipment is just being replaced with double-deck screens which have not as yet been tested with the punched plate screening.



Old punched plate used in a vibrating screen

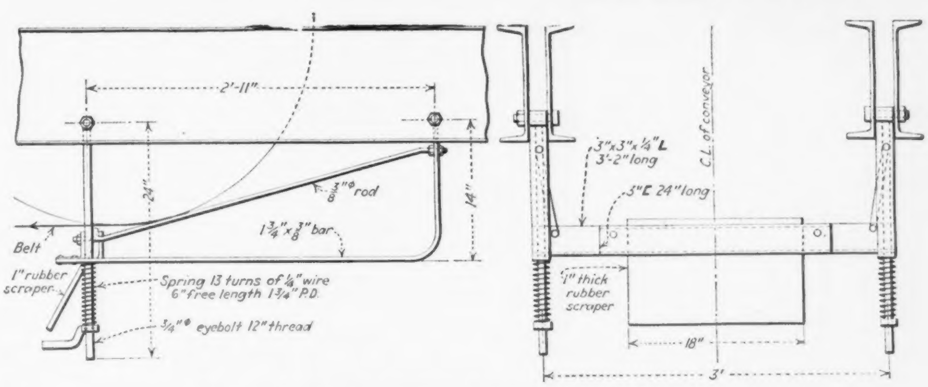
Scraper for Cleaning Conveyor Belts

A RUBBER SCRAPER for cleaning conveyor belts was devised and constructed early in 1920 by men working at the filter plant of the Inspiration Consolidated Copper Co. It has proved successful and satisfactory in every way. Details of design are given in the accompanying sketch.

The scraper shown in the illustration was 18 in. wide and was used with a 20-in. belt. It consisted of a piece, 1 in. thick, of U. S. Rubber Co.'s No. 700 stock or its equivalent, held between angle iron clamps as shown. At present a 24-in. belt is being used with a scraper 22 in. wide. The thickness of the rubber has also been increased from 1 in. to 1⅛ in. The rubber is fairly hard, of the same consistency apparently as the outer rubber in an automobile tire casing.

Springs are provided to hold the scraper against the belt surface. The compression of these springs is controlled by the wing nuts at the end. As the scraper wears it is necessary to reset it occasionally between the angle irons.

The belt upon which the scraper is used is handling flotation concentrate, the moisture of which has varied from 20% to 8% over a period of years. The stickiness of the concentrate has also varied, depending on the insoluble content. A scraper on this belt has always been necessary. Originally very heavy elevator belting was used for the scraper, and the wear on it amounted to about 1 in. in four days. When the rubber scraper was installed the wear was reduced to 1 in. in 16 days. At that time the belt was traveling 150 ft. per minute. Since then this speed has been reduced to 50 ft. per minute, with a reduction in wear on the scraper to about 2 in. per year. The scraper made of elevator belting originally used undoubtedly held fine concentrate in its plies and caused heavy wear, both on itself and on the conveyor belt.—Guy H. Ruggles, in *Engineering and Mining Journal.*



Details of rubber scraper for cleaning conveyor belts

Preventing Aggregate Segregation

ONE of the serious problems of aggregate producers in districts where specifications are strict is to prevent segregation of the fines from the coarser material, especially where they are recombined after screening and washing. This is just the result of the natural properties of the materials which cause the large particles to tend to run toward the outside and the fines to accumulate at the center. This condition is especially noticeable if the remixed aggregate is allowed to build itself into a pile of considerable height as in a bin or stockpile.

At the distributing yard of the American Aggregates Corp. serving the downtown districts of Columbus, Ohio, this problem of segregation has been simply and successfully solved by constructing a series of short spouts or chutes in such a fashion that the material is subjected to a series of cataracts or breaks in its fall as it drops into the bins. The basic idea involved can best be seen by referring to the illustration.

This series of chutes is constructed of steel and is sufficiently rugged to withstand the pulling stresses set up by the downward movement of the main body of gravel as withdrawals are made from below.

An arrangement at the bin which does much to prevent segregation

Passenger Elevators in Silos

AT THE CUBAN PORTLAND cement plant, Mariel, Cuba, there are four main silos, each holding 15,500 bbl. of cement. The silos are 80 ft. high and for the convenience of the men charged with the responsibility of filling and reclaiming the cement in these silos an automatic passenger elevator has been installed.

This elevator is a patented article and does not differ, except as to detail, from the types found in most any modern apartment or flat building. The sign within the latticed elevator compartment cautions the operator to be sure to close the doors before operating the "ascension."

Atlas Portland's New Waco Mill Damaged by Storm

ACCOMPANIED by a driving rain, a 40-mile wind caused considerable property damage at Waco, Tex., recently. The Atlas Portland Cement Co.'s new plant, practically completed, is reported to have met with considerable damage, although no exact figures are available.

Three hundred men were housed in and about the plant at the time the wind struck, blowing cement slabs from the roof of the mill building and machine shop, each piece weighing as much as 150 lb., and not a man was injured, it was reported. It was stated that every steel window frame was blown from the windows of the two buildings and all framework and scaffolding around the crusher was blown over the countryside. The largest part of the loss, however, will be to the roofs, as steel pieces came crashing down on the unprotected ceilings of the mill building, knocking large holes in it.

At the machine shop a large steel door, used for train engines to pass in and out of, was jerked from its position, curled up like tin and carried far out into the yard. In the clock house, where workmen punched their time cards, four men were standing when the storm came. The house was blown completely away, leaving the workmen standing on the floor. One took refuge in the ice box while the others found places of safety elsewhere.—*Waco* (Tex.) *News-Tribune.*

Lick Creek Gravel Company Sold to Homer Rodeheaver

HOMER RODEHEAVER, former choir leader for the Rev. William A. (Billy) Sunday and composer of several religious songs, heads the newly incorporated Granite Sand and Gravel Co., it was announced in the *Indianapolis* (Ind.) *News.*

Other officers of the company are J. N. Rodeheaver, vice-president and treasurer, and C. W. Stevens, secretary and general manager. The new company has bought the Lick Creek Sand and Gravel Co. from Robert K. Eby, receiver, for a reported price of $60,000.

The Granite Sand and Gravel Co. is situated at 4400 Bluff road and is said to be one of the most modern plants in Indianapolis.

According to Mr. Stevens, a railroad spur is being built to accommodate shipments to building, street and highway contractors outside of the city.

Southwestern Portland to Build Testing Laboratory

A NEW MODERN physical and chemical testing laboratory is planned for the El Paso Texas, plant of the Southwestern Portland Cement Co., according to an announcement in the *El Paso* (Texas) *Herald.* The building, to be located at the entrance to the company's property, will also house the offices of the chief chemist, superintendent and timekeeper. Excavation work has already started and the building is expected to be ready within three months.

Several plant improvements are under way and include a new tube mill for the raw grinding department which is being installed. The plant, according to H. E. Nichols, superintendent, is running full capacity and has been doing so all winter.

"Shipments are keeping pace with those of last year when the plant operated at practically full capacity, indicating that building throughout the territory is above normal," Mr. Nichols stated.

Southern Gravel to Start Operations Soon

WORK AT THE new gravel plant near Austin, Tex., of the Southern Gravel Co. is being rapidly rushed to completion, according to A. D. Alderson, vice president and general manager of the firm. Mr. Alderson stated that he expects his company to be actively loading gravel at this plant early in June.

"When we came here we allotted $20,000 in stock to be subscribed by the people of Austin. We now have only $5000 of this stock to be sold. And I believe that this small amount will be subscribed shortly. I am highly pleased with the type of business and professional men of Austin who have become associated with us as stockholders in the company," stated Mr. Alderson.

Mr. Alderson states that the plant at Montopolis bridge is the only one in the state located on three railroads and that this means much economy in shipping. He also said that the output for this plant for the first year of operation has already been sold and that it may be necessary to operate on a double-shift basis.—*Austin* (Tex.) *American.*

Texas Gravel Companies Merge Interests

FORMATION of the Texas Construction Material Co., with offices in the Post-Dispatch building, Houston, was announced by W. E. Sampson, vice-president and general manager. The capitalization of the new concern is $600,000, Mr. Sampson said. It was formed by the consolidation of the Gemmer and Tanner, Beaumont Building Material and Gravel properties.

Officers, besides Mr. Sampson, are H. W. Gemmer, president; E. A. Fletcher, vice-president; E. P. Gemmer, secretary-treasurer, and officers and T. S. Reed and T. J. Beesley, directors. The new concern will handle the sand and gravel business, having a daily output of 100 carloads a day.—*Beaumont* (Tex.) *Enterprise.*

Newaygo Portland to Start Work on Charlevoix, Mich., Project

THE construction of a new modern portland cement mill at Charlevoix, Mich., to be linked with the local plant, that will involve the building of a new harbor and the opening of quarries, was unanimously approved at a meeting of stockholders of the Newago Portland Cement Co. held at Grand Rapids, Mich., recently. The details have not been completed but work is to be started.

The new plant will be ideally located as both the shale and rock supply will be available at the same quarry. Coal will be received by water, the same as it is at the Manitowoc, Wis., plant. A new crushing plant will produce the rock supply for both the Manitowoc and the Newaygo plants. This will reduce the hauling distance for the stone by almost half and will effect a saving in freight. The stone which is used at the Manitowoc plant is secured from the Kelley Island Lime and Transport Co. and is freighted by water from Rockport, Mich.

The Newago company has owned the property at Charlevoix for a number of years and a thorough investigation of the situation brought a proposal to erect a new plant at that point. Recently the Charlevoix city council granted the Newago company four and one-half acres of land and a 50 ft. right of way, following a conference with J. B. John, president of the Newago company, who explained plans of his company which recently purchased the property of the defunct Rock Products Co. The city owned the 4½ acres between two sections owned by the company and a 50-ft. right of way adjoining the Newago company's 50 ft. right of way.

It was agreed that in return for a gift of the four and a half acres and the city's right of way, the Newago company will finish its plant within two years. Mr. John assured the council that by September 1 at the latest he will have 250 men at work.

It is understood that the company will build a lime plant on the plot just deeded to it.—*Manitowoc* (Wis.) *Times.*

Receivership Asked for New Inland Gravel Co.

SUIT has been filed by L. E. Faulkner, general manager of the Mississippi Central Railroad Co., against J. J. Haney, his partner in the New Inland Gravel Co., in which Faulkner asks a receivership of the gravel concern in order to pay $16,500 indebtedness against the partnership. The case is scheduled for hearing before Chancellor T. Price Dale.

Mr. Faulkner claims that J. W. Oden is contemplating a foreclosure against Haney's half-interest in the gravel firm and he is asking the receivership so that all the partnership debt may be paid and the remainder divided equally between him and Mr. Haney.—*Meridian* (Miss.) *Star.*

Editorial Comment

Governmental Jealousies

Our national constitution carefully and specifically defines three separate and distinct branches of the government: (1) Executive; (2) Legislative; (3) Judicial. Fear of one of these branches that another is encroaching upon its special rights and field is responsible for much governmental inefficiency. It prevents Congress from granting the President power to adjust the tariff on truly economic lines; it has caused the Federal Trade Commission to take in its horns, so that its influence in industrial and trade conferences is much weakened. It is one of the prices we pay for democracy, although probably not a necessary price, for legislators and lawyers could be more business-minded to the public's advantage.

A Concrete Specification

Nathan C. Johnson, a well-known consulting engineer of New York, examines current concrete making practice in a series of articles published recently in *Engineering News-Record* (abstracted in ROCK PRODUCTS, May 11). He finds present specifications too intolerant; practice too narrow; that contractors and engineers know of violations and ignore them because the work must go on. If the contractor is sufficiently pugnacious and skilful and knows how to use finesse with the owners, he can get away with almost anything, even to having an expert testify that the holes through an 8-ft. reservoir wall were merely superficial and of no importance. But building codes are such that structures stand even though they are layers of honeycomb and laitance, for even laitance will bear the loads permitted by the code.

He proposes a specification that can be lived up to, under which all will be treated alike. The gist of it can be given in a single sentence: Use one part of cement, never more than two parts of sand (less if the sand is fine), as much stone or gravel as the mix will comfortably carry and just enough water to give a mushy or workable consistency without separation. This is to be well puddled and the forms are to be filled to the top in one continuous pour. Under such a specification, he says, the constructor can use local materials (with the sanction of the engineer) and get as good a job as the materials permit.

There is a natural hesitancy about criticising one of Mr. Johnson's knowledge and reputation, but it seems fair to point out that this specification gives just as much chance to get away with things as any that we now have. And, while everyone is agreed that the water-cement ratio should be the basis of all design of concrete mixes, this specification merely says that just water enough to make the concrete workable should be allowed. How is the workability to be judged and who shall judge it? Then there is the question of materials, especially the aggregates. The producers of aggregates have spent a lot of time and money to bring their product to where it could be used in scientifically designed concrete. This has been appreciated by highway engineers and others who wanted to make a superior class of concrete, but the producers occasionally see their product passed by, and a contract given to a wayside pit, because such a loose specification as the above permits it. It is true that the building-code requirements are so low that the poorest sort of concrete will support the load, but that does not seem a good reason for permitting the use of sloppy and badly proportioned concrete. It is rather a reason for changing the building code to give scientifically-made concrete a chance.

Laboratory studies and their application to design may have resulted in some narrowness and intolerance, but the quality of concrete has steadily improved. As an example, California highway concrete has been raised from 2500 lb. to 4000 lb. per sq. in. compressive strength in the past few years with no extra cost for material or labor. In the same laboratory studies have developed quick-hardening concrete, of immense value in making road repairs, sidewalks and other work that must be quickly used, so that the cost of extra cement and carefully selected aggregates is of no importance. It is true, as Mr. Johnson shows by calculations that run into trillions, that laboratory conditions can never be duplicated in the field, but enough can be, and has been, brought in from the laboratory to make field practice increasingly better. For one thing, it has served to put emphasis on the important things, that, for example, the leaving of half a pound of cement in each bag, which Mr. Johnson shows robs the cement of needed units of strength, is not nearly so serious as dumping an extra pail of water into the batch when the mix seems to some laborer to be a little too stiff to be "workable."

It is also true that other things than strength are equally important in concrete, but one can hardly agree with Mr. Johnson's statement that "strength is mere dogma." The impression left from reading the articles is that he feels that the concrete we make is going to be strong enough anyway to support all the load the code will permit; let us therefore mix concrete so that it will pour easily and look well and let the strength take care of itself. It could be done, of course, with Mr. Johnson in charge, or any other engineer who would insist on no more than the proper amount of water going into the mixer, and one who would insist equally on the aggregates being of good quality and on their being correctly proportioned. An engineer who knows his business will put in good concrete without any specifications. But to say that, is not to say that specifications which really specify something are not better for general use and are not resulting in better concrete.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[29]	6- 5-29	92	....	
Alpha P. C. new com.	6- 1-29	45	47	75c qu. Apr. 15
Alpha P. C. pfd.	6- 1-29	116	....	1.75 qu. June 15
American Aggregates com.[45]	6- 5-29	46	49	75c qu. Mar. 1
Amer. Aggregate 6's, bonds	6- 1-29	105	....	
American Brick Co., sand-lime brick	6- 1-29	13	14	25c qu. Feb. 1
American Brick Co. pfd., sand-lime brick	6- 1-29	84½	86	50c qu. Feb. 1
Am. L. & S. 1st 7's[29]	6- 5-29	97	101	
American Silica Corp. 6½'s[49]	6- 4-29	96	100	
Arundel Corp. new com.	6- 3-29	39	....	50c qu. Apr. 1
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	6- 4-29	70	80	
Atlas P. C. com.	6- 1-29	47	50	50c qu. June 1
Beaver P. C. 1st 7's[20]	5-31-29	98	101	
Bessemer L. & C. Class A[4]	5-31-29	34	35	75c qu. May 1
Bessemer L. & C. 1st 6½'s[4]	5-31-29	97	98	
Bloomington Limestone 6's[29]	6- 5-29	90	92	
Boston S. & G. new com.[16]	6- 1-29	18	22	
Boston S. & G. new 7% pfd.[16]	6- 1-29	48	50	
Canada Cement com.	5-31-29	26	26¾	
Canada Cement pfd.	5-31-29	....	97	1.62½ qu. June 29
Canada Cement 5½'s[43]	5-31-29	98¾	99½	
Canada Cr. St. Corp. 1st 6½'s[43]	5-31-29	96	99	
Canada Gyp. & Alabastine	5-29-29	103	104	75c Jan. 2
Certainteed Prod. com.	6- 3-29	26⅝	27⅛	
Certainteed Prod. pfd.	6- 3-29	78	81	1.75 qu. Jan. 1
Cleveland Quarries new st'k	6- 4-29	70	....	50c & 25c ex. June 1 & 50c Sept. 1
Columbia S. & G. pfd.	6- 3-29	88	92	
Consol. Cement 1st 6½'s, A[42]	6- 4-29	92	95	
Consol. Cement 6½% notes[29]	6- 5-29	75	80	
Consol. Cement pfd.[29]	6- 5-29	50	60	
Consol. Oka S. & G. 6½'s[12] (Canada)	5-17-29	101	103	
Consol. S. & G. com. (Canada)	5-29-29	....	18	
Consol. S. & G. pfd. (Canada)	5-29-29	80	85	1.75 qu. May 15
Construction Mat. com.	6- 3-29	28	28¾	
Construction Mat. pfd.	6- 3-29	44	45½	87½c qu. May 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[18]	5-31-29	97	99	
Coosa P. C. 1st 6's[29]	6- 5-29	50	60	
Coplay Cem. Mfg. 1st 6's[40]	6- 3-29	90	....	
Coplay Cem. Mfg. com.[40]	6- 3-29	15	....	
Coplay Cem. Mfg. pfd.[40]	6- 3-29	75	....	
Dewey P. C. 6's[30] (1930-41)	6- 4-29	98	....	
Dewey P. C. 6's[30] (1942)	6- 4-29	101	....	
Dolese & Shepard	6- 3-29	100	105	$2 qu. July 1
Edison P. C. com.[39]	5-18-29	10c	....	
Edison P. C. pfd.[39]	5-18-29	25c	....	
Giant P. C. com.[25]	5-31-29	38	41	
Giant P. C. pfd.[25]	5-31-29	37	40	
Ideal Cement, new com.[33]	5-31-29	73	75	75c qu. Apr. 1
Ideal Cement 5's, 1943[33]	5-31-29	100	102	
Indiana Limestone units[29] (5 shs. com. & 1 sh. pfd.)	6- 5-29	100	105	
Indiana Limestone 6's	6- 3-29	89½	....	
International Cem. com.	6- 3-29	89	90	$1 qu. June 28
International Cem. bonds 5's	6- 3-29	102	103⅜	Semi-ann. int.
Iron City S. & G. bonds 6's[46]	5-31-29	92	95	
Kelley Is. L. & T. new st'k	6- 4-29	55	56	62½c qu. Apr. 1
Ky. Cons. Stone Co. com.[48]	5-31-29	14	15	
Ky. Cons. St. com. Voting Trust Certif.[48]	5-31-29	14	15	
Ky. Cons. Stone 6½'s*[48]	5-31-29	96	100	
Ky. Cons. St. Trustee Certif.[48] (1 Sh. 7% cum. pfd. & 1 sh. com. stock)	5-31-29	99	103	
Lawrence P. C.	6- 1-29	92	97	
Lawrence P. C. 5½'s, 1942	5- 8-29	91	94	
Lehigh P. C.	6- 3-29	52½	54	62½c qu. Aug. 1
Lehigh P. C. pfd.	6- 3-29	108½	109½	1¾% qu. July 1
Lyman-Richey 1st 6's, 1932[13]	5-31-29	98	100	
Lyman-Richey 1st 6's, 1935[13]	5-31-29	97	99	
Marblehead Lime 6's[14]	5-17-29	98	100	
Material Service Corp.	6- 5-29	30½	33¾	50c qu. June 1
Medusa Portland Cem.[29]	6- 5-29	124	128	
Mich. L. & C. com.[6]	5-31-29	35	....	
Missouri P. C.	6- 3-29	42½	43	50c qu. May 1
Monolith Midwest[9]	5-31-29	8½	10	
Monolith bonds, 6's[9]	5-31-29	97	98	
Monolith P. C. com.[9]	5-31-29	14	14½	8% ann. Jan. 2
Monolith P. C. pfd.[9]	5-31-29	9	9½	
Monolith P. C. units[9]	5-31-29	32	33½	
National Cem. (Can.) 1st 7's[38]	6- 5-29	95	98	
National Gypsum A com.	6- 3-29	23	26	
National Gypsum pfd.	6- 3-29	53	....	
Nazareth Cem. com.[26]	6- 1-29	25	29	
Nazareth Cem. pfd.[26]	6- 1-29	100	105	
Newaygo P. C. 1st 6½'s[29]†	6- 5-29	102½	104	
New Eng. Lime 1st 6's[14]	5-31-29	96	98	
N. Y. Trap Rock 1st 6's	6- 1-29	98½	....	
North Amer. Cem. 1st 6½'s	6- 1-29	71¾	73½	
North Amer. Cem. com.[29]	6- 5-29	6	8	
North Amer. Cem. 7% pfd.[29]	6- 5-29	26	31	
North Amer. Cem. units[29]	6- 5-29	35	42	
North Shore Mat. 1st 5's[15]	6- 4-29	97	100	
Northwestern States P. C.[37]	5-31-29	127	....	
Ohio River S. & G. 6's[16]	6- 1-29	90	95	
Pac. Coast Cem. 6's, A[5]	5-31-29	92¾	96½	
Pacific Lime Co. pfd.[11]	5-17-29	60	65	
Pacific P. C. com.	5-31-29	22	25	
Pacific P. C. pfd.	5-31-29	79	81	1.62½ qu. Jan. 5
Pacific P. C. 6's[5]	5-31-29	98¾	....	
Peerless Egyp'n P. C. com.[1]	5-31-29	2¼	2¾	
Peerless Egyp'n P. C. pfd.[1]	5-31-29	84	88	
Penn-Dixie Cem. 1st 6's	6- 3-29	98⅞	....	
Penn-Dixie Cem. pfd.	6- 3-29	75	80¼	1.75 qu. June 15
Penn-Dixie Cem. com.	6- 3-29	17	18½	
Penn. Glass Sand Corp. 1st 6's, 1952	5- 8-29	101	103	
Penn. Glass Sand pfd.	5- 8-29	112	....	
Petoskey P. C.	6- 3-29	10	10¾	1½% qu.
Riverside P. C. com.	4- 5-29	20	....	
Riverside P. C. pfd.[9]	5-31-29	....	21	1.50 qu. May 1
Riverside P. C., A[20]	5-31-29	....	21	31¼c qu. May 1
Riverside P. C., B[44]	5-16-29	5	6½	
Santa Cruz P. C. bonds	5-31-29	105¾	....	6% annual
Santa Cruz P. C. com.	5-31-29	91	....	$1 qu. Apr. 1
Schumacher Wallboard com.	5-31-29	15	15½	
Schumacher Wallboard pfd.	5-31-29	23½	25	
Southwestern P. C. units[44]	5-16-29	275	....	
Standard Paving & Mat. (Can.) com.	5-29-29	33½	34	50c qu. May 15
Standard Paving & Mat. (Can.) pfd.	5-29-29	95	98	1.75 qu. May 15
Superior P. C., A[20]	5-31-29	41¾	43	27½c mo. Mar. 1
Superior P. C., B[20]	5-31-29	28	28½	
Trinity P. C. units[37]	5-31-29	148	155	
Trinity P. C. com.[37]	5-31-29	43	....	
Trinity P. C. pfd.[29]	5- 8-29	99	....	
U. S. Gypsum com.	6- 3-29	74½	75	2% qu. June 30
U. S. Gypsum pt. paid	6- 3-29	64	65	
U. S. Gypsum pfd.	6- 5-29	126	127	1¾% qu. June 30
Universal G. & L. com.[3]	6- 4-29	....	1	
Universal G. & L. pfd.[3]	6- 4-29	....	10	
Universal G. & L., V.T.C.[3]	6- 4-29	No market		
Universal G. & L. 1st 6's[3]	6- 4-29	....	60	
Warner Co. com.[16]	6- 1-29	35	38	50c qu. Apr. 15
Warner Co. pfd.[16]	6- 1-29	96	99	1¾% qu. Apr. 25
Warner Co. 1st 6's[8]	6- 4-29	98¾	99	
Whitehall Cem. Mfg. com.[36]	5-31-29	150	....	
Whitehall Cem. Mfg. pfd.[36]	5-31-29	98	....	
Wisconsin L. & C. 1st 6's[15]	6- 4-29	98	101	
Wolverine P. C. com.	6- 3-29	6½	6¾	15c qu. May 15
Yosemite P. C., A com.[20]	5-31-29	4¼	4¾	

*Ann. interest due May and Nov. 1. Semi-ann. coupon of $32.50 paid Nov. 1. †First 6½'s 1938 called for redemption at 104½, June 1.

[1]Quotations by Watling Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler Beadling & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Dillon, Read & Co., Chicago, Ill. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Peters Trust Co., Omaha, Neb. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co., of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., Detroit. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach & Co., Inc., Chicago. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White & Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher-Newton & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter & Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick & Co., Montreal Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks, New York City and Chicago. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney, Williams & Co., Inc., Los Angeles, Calif. [45]Taylor Ewart & Co. [46]Stein Bros. & Boyce, Baltimore, Md. [47]Bank of Pittsburgh, Pittsburgh, Pa. [48]E. W. Hays & Co., Louisville, Ky. [49]Blythe Witter & Co.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Brick Co. pfd. (sand-lime brick) 16 sh.[6]	par 25	25¾
American Brick Co. pfd., 5 sh.[2] (par 25)	25	....
Atlantic Gypsum Products[6] com., 200 shares	$2 per share	....
International Portland Cement Co., Ltd., pfd.	30	45
Knickerbocker Lime Co.[4]	105	....
Seaboard P. C.[1] 6% bonds ($7,500) 7-1-27. July, 1910, and subsequent coupons attached	$10 for the lot	....
Southern Phosphate Co.[6]	1¼	....
Universal Gypsum com. free stk.[1] 300 shares	$75 for the lot	....
Universal Gypsum com.[1] 153 shares (no par)	$51 for the lot	....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	....
Winchester Brick Co., pfd., sand lime brick[5]	10c	....
Winchester Rock Brick Co., pfd., 1 share (par $25) and 1 share com. (par $10)[6]	$8 for the lot	....

[1]Price obtained at auction by Adrian H. Muller & Sons. New York. [2]Price at auction by R. L. Day & Co.. April 24, 1929. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, on April 4, 1928. [5]Price obtained at auction for lot of 50 shares by R. L. Day & Co., Boston, Mass. [6]Price obtained at auction by Wise Hobbs and Arnold, Boston, Mass.

Annual Report of Lawrence Portland Cement

EXTRACTS from the annual report of Frank H. Smith, president of the Lawrence Portland Cement Co., to its stockholders follow:

At the Northampton, Penn., plant the principal improvements in the Bonneville quarry include a new pump house, an auxiliary gasoline motor driven pump so equipped that it can be operated with an electric motor which has been provided for it, and the substitution of steel stairs to replace wooden stairs at the trestle at which stone for the vertical kilns is loaded.

Additions and improvements to buildings at the Northampton plant include a 15,000-gal. storage tank, pumps and a concrete gasoline service station permitting the company to buy gasoline in tank car lots for locomotives, trucks and automobiles, a new roof on the building housing the clinker grinding equipment and motors and minor changes in the other buildings to provide space for equipment, operations and more adequate quarters for draughtsmen.

In the machine shop a steel and iron bending machine was purchased and installed. In the coal mill an air compressor formerly used in another department has been installed to improve operating conditions.

In the raw grinding department the main stone dryer was equipped with seal rings, the entrance and exit of the crusher room have been enlarged to provide safer working conditions for your employes and automatic scale has been installed for automatically weighing the raw materials used in the manufacture of cement.

In the kiln department numerous minor changes were made to improve operating conditions, including seal rings on the kilns, changed drives for the conveyors for the kilns, changes in size of the conveyors, a new stack at one of the coolers, lengthening of drag chain conveyor, construction of a portable clinker reclaimer and a portable belt conveyor for use in connection with this reclaiming unit.

In the "Hy-Test" masons' cement department a number of experiments were made to improve the quality of the "Hy-Test" cement which is manufactured for the Hy-Test Cement Co., and the results of the experiments were very satisfactory.

At the stock houses, packing houses and bag house, the more important changes are the replacement of the pump conveying system with screw conveyors and the transfer of these pumps and sections of the pipe lines of this system to the Thomaston, Maine, plant and the enlargement of No. 3 packing house to permit the installation of an additional Bates valve-bag packing machine for sacking.

The Pennsylvania Power & Light Co., from which electric current is purchased for the operation of the entire plant, issued a new tariff effective May 16, 1928. Between January 1 and May 15 purchased current was supplied at a cost of $0.01154 per k.w.h. and since May 16 the current has cost $0.01032 per k.w.h.

The largest production of any month at Thomaston was 100,356 bbl. and the largest shipment of any one month was 100,858 bbl.

Due to the fact that anticipated reductions in freight rates from Thomaston did not become effective until late in 1928, and to the competition from foreign cements in cities along the New England coast, the Thomaston mill was not operated at full capacity for the entire year.

Since the completion of the plant in accordance with the plans, additions to plant and equipment at Thomaston include a new pump in one of the quarries to take care of all the water from both quarries, the erection of a building in which to store fire brick, the conversion of three labor camp buildings (required during the construction of the plant) into garages for the use of employes, the construction of 14 hydrant houses around the yard and the enclosing of one end of the building used for the storage of crushed stone, clinker and gypsum.

A new 6-in. Fuller-Kinyon pump was purchased and installed in the clinker grinding department for the transfer of cement from the mill to storage, replacing one of the two 8-in. pumps which is held in reserve.

In the mill yard the freight tracks were extended 200 ft. on both sides of the cement storage silos to provide space for 15 cars on each track of this department.

The lime plant on the Thomaston property was not operated at full capacity on account of the general depression in the lime business. The lack of a hydrating plant has made it necessary to purchase hydrated lime as needed for mixed car orders of cement and lime. Improvements in this department are contemplated to enable the company to meet demands for all kinds and classes of lime that can be manufactured in the New England district, which should reduce the cost of production.

The Calcite Quarry Corp., Myerstown, Penn., was organized and is functioning, the new quarry has been developed as rapidly as possible and the production of limestone from the new operation should show increased tonnage in 1929.

Balance Sheet of Superior Portland Cement

THE balance sheet of the Superior Portland Cement, Inc., as of December 31, 1928, is as follows:

BALANCE SHEET OF THE SUPERIOR PORTLAND CEMENT, INC.
(December 31, 1928)

ASSETS	
Real estate, plant, etc.	$5,574,770
Investments	771,983
Inventories	310,257
Notes and accounts receivable	110,990
Cash	91,338
Deferred assets	149,369
	$7,008,707
LIABILITIES	
Capital stock and surplus	$6,735,320
Accounts payable	52,004
Pay rolls	22,695
Reserve for taxes	193,314
Other reserves	5,374
	$7,008,707

CEMENT AND LIME MANUFACTURED, PURCHASED AND SOLD IN 1928 BY LAWRENCE PORTLAND CEMENT CO.

	Manufactured	Purchased	Sold
Portland cement (bbl.)	2,645,485	4,635	2,507,169
"Super-Dragon" (bbl.)	60,285	....	42,770
"Special-Mix" (bbl.)	4,207	....	4,870
"Hy-Test" (bbl.)	331,422	....	331,494
Specialties (bbl.)	....	1,364	1,339
Lime (net tons)	14,051	354	14,720

CONDENSED STATEMENT OF INCOME FOR THE YEAR ENDED DECEMBER 31, 1928

Income from sales of cement and lime	$1,007,391.46
Other income	76,089.52
	$1,083,480.98
Provision for depreciation, interest, bond discount amortization and federal taxes	361,761.08
Net income carried to surplus account	$ 721,719.90

CONDENSED BALANCE SHEET OF THE LAWRENCE PORTLAND CEMENT CO. AS AT DECEMBER 31, 1928

ASSETS		
Land, buildings, plant and equipment	$11,273,140.78	
Deduct: Amount reserved for depreciation, etc.	2,223,256.38	$ 9,049,884.40
Current assets:		
Cash and accounts receivable	$ 752,383.06	
Cement, materials and supplies on hand (cost)	1,520,176.23	2,272,559.29
Investment assets		196,300.00
Deferred charges (including unamortized bond discount)		108,659.52
		$11,627,403.21
LIABILITIES		
Current liabilities (accounts payable) (excess of current assets over current liabilities, $1,927,278.77)		$ 345,280.52
Funded debt:		
Fifteen-year 5½% gold debenture sinking fund bonds, due April 1, 1942	$2,000,000.00	
Notes payable, due serially beginning November 1, 1929	300,000.00	2,300,000.00
Capital stock, issued and outstanding		7,500,000.00
Surplus (after deducting estimated federal taxes)		1,482,122.69
		$11,627,403.21

Dolese and Shepard 1928 Annual Report

EXTRACTS from the annual report of J. F. Talbot, president of the Dolese and Shepard Co., one of the largest crushed-stone producers in the Chicago, Ill., district, follow:

Car shipments of crushed stone decreased 17%, while shipments by auto truck increased 43%. The increase in shipments of crushed stone by truck indicates an important change in the trend of the business.

There was a 13% decrease in the number of cubic yards produced, while the cost per yard remained the same as in 1927. A contributing factor to this result is disclosed by records which show that 51% of employes have been with the company more than five years, 25% more than 10 years and 13% more than 18 years.

Expenditures for new equipment during 1928 amounted to $86,040. This amount includes the cost of five new quarry cars and $19,000 spent for electric motors for use in additional cars for which the contracts have already been placed. As the new motors are larger and better than those previously used, it is expected the haulage system (Woodford centrally controlled electric) will become more efficient.

Losses from bad debts during the year were less than 1/36 of 1%. The excess reserve for prior years' income taxes which has been added to surplus amounted to $15,005.86. Cash reserve for dividends, which is invested in Chicago and state of Illinois bonds, drawing 4%, remains unchanged ($207,182.68).

A considerable amount of business was refused during 1928 because of low prices offered. The leading feature of the business done during 1928 is that the company paid its stockholders $220,202, which is 23% on the par value of the capital stock, the largest dividend paid in the history of the company.

COMPARISON OF INCOME OF THE DOLESE AND SHEPARD CO. FOR THE YEARS ENDING DECEMBER 31

	1828	1927
Net sales stone	$764,980.27	$881,545.34
Less cost of stone sold	482,825.35	527,977.30
Gross profits on sales stone	$282,154.92	$353,568.04
Less office and selling expenses	106,831.50	104,032.57
Net profit on sales stone	$175,323.42	$249,535.47
Add miscellaneous income less miscellaneous expense	67,728.55	116,082.85
Net profit before income taxes	$243,051.97	$365,618.32
Less reserve for income taxes	27,944.99	48,600.00
Net profit	$215,106.98	$317,018.32

COMPARISON OF BALANCE SHEETS OF THE DOLESE AND SHEPARD CO.
(At December 31, 1928 and 1927)

ASSETS

	1928	1927
Cash on hand and in bank	$ 83,711.10	$ 165,084.11
Marketable securities—at cost	207,182.68	207,182.68
Accounts receivable	48,849.92	55,042.91
Notes receivable	2,599.28	786.90
Mortgage note receivable	16,785.00	16,785.00
Interest receivable	3,735.86	3,734.55
Inventories	88,324.98	94,343.08
Prepaid expenses	3,821.01	3,210.49
Total current assets	$ 455,009.83	$ 546,169.72
Capital assets:		
Plant and equipment	$1,162,638.37	$1,103,181.03
Less depreciation reserve	640,663.17	628,777.11
Plant and equipment—net	$ 521,975.20	$ 474,403.92
Real estate	612,716.86	614,396.16
Total capital assets	$1,134,692.06	$1,088,800.08
	$1,589,701.89	$1,634,969.80

LIABILITIES

	1928	1927
Current liabilities:		
Accounts payable	$ 22,121.83	$ 16,054.47
Dividends payable	38,296.00	57,444.00
Local tax reserve	12,633.74	11,598.40
Income tax reserve	28,000.00	48,600.00
Prior years' income tax reserve	....	41,681.45
Total current liabilities	$ 101,051.57	$ 175,378.32
Net worth:		
Capital stock outstanding	$ 957,400.00	$ 957,400.00
Surplus, December 31	531,250.32	502,191.48
Net worth	$1,488,650.32	$1,459,591.48
	$1,589,701.89	$1,634,969.80

American Diatom Co. Under New Management

DAVID FULMER KEELY, Donald F. Bishop and Le Roy S. Bishop of Philadelphia, Penn., have acquired control of the American Diatom Co. (of New Jersey), having a wholly owned subsidiary, the American Diatom Corp. of Virginia.

This company, it is stated, controls, owns and leases the only known extensive deposits of high grade diatomaceous earth on the Atlantic seaboard, located on the Rappahannock river, Virginia, and the Patuxent river, Maryland. The company's supply of diatomaceous earth is said to be practically inexhaustible.

The company recently purchased an industrial plant on the Delaware river at Gloucester, N. J., which is now being converted into a refinery, and expected to be in full operation in the immediate future.

The capital structure of the company upon completion of present financing will be as given above.

CAPITAL STRUCTURE, AMERICAN DIATOM CO.

	Authorized	Outstanding
First mortgage 10-year 6% bonds due March 1, 1938	$500,000	350,000
7% cumulative preferred stock (par $100)	500,000	None
Class A (no par) non-voting common stock	10,000 shares	*5,650 shares
Voting common stock (no par)	7,000 shares	7,000 shares

*The balance held in the treasury is for corporate purposes and reserved for exercise of option warrants accompanying first mortgage bonds.

Officers—President, David Fulmer Keely; vice-president, Donald F. Bishop; secretary, Herbert E. Nagel; treasurer, Le Roy S. Bishop; operating manager, Dr. Jos. L. Klaudi, chief engineer. Executive offices, 617 Witherspoon building, Philadelphia.

National Gypsum Co. Sales Increase in First Quarter

INDICATIVE of the increasing activity in the building trades, M. H. Baker, vice-president in charges of sales, reported to the directors of the National Gypsum Co., Buffalo, N. Y., that bookings for the first quarter of the year exceeded the same period in 1928 by 16%. "This increase is considered especially significant," stated Mr. Baker, "in view of the severe weather conditions obtaining, until just recently, in both the Northwest and the South."

Sales during 1928 were 47% greater than in 1927, despite the keenly competitive condition in the gypsum industry. Six new products were developed during the year in addition to "Gold Bond" plaster and wallboard on which the business was founded in 1926, the new products consisting of insulation board, exterior sheathing board, "Troweltex," "Texture" paint, exterior colored stucco, and dry-fill insulation.

Commenting on the business outlook for 1929, Mr. Baker stated that conditions were exceedingly favorable for a continuation of increased volume throughout the year. The company has obtained well organized distribution, having attracted a large number of new dealers in the past six months. The lime plants of the Luckey Lime and Supply Co. at Luckey, Ohio, were acquired last fall and it has already been necessary to extend these plant facilities by the installation of additional kilns.

(Mr. Baker was recently elected president to fill the vacancy caused by the death of J. F. Haggerty.—Editor's Note.)

Annual Report of Alpha Portland Cement

FOLLOWING are extracts from the annual report of G. S. Brown, president of the Alpha Portland Cement Co., to its stockholders:

While the cement industry in 1928 again had record shipments, the total for the year being, according to the Bureau of Mines, 175,000,000 bbl. as compared with 171,000,000 bbl. in 1927, the company did not increase its shipments proportionately. Shipments for the year are less than they were in 1927. This is due to the fact that, while shipments for the United States, as a whole, increased, there was a reduction in the amount of cement shipped from the plants located in the eastern and the southeastern part of the country, where the company has large production. In addition, new capacity came into production in the northeastern part of the United States amounting to nearly 2% and in the southeast nearly 15% of possible shipments, when compared with 1927. Importations into the eastern part of the United States were also materially greater than they were in the previous year.

The average price received for the product was less than in 1927. Despite this fact, the net earnings for the year were something over $226,000 greater than were shown in 1927.

Operating costs for the year were lower per barrel than for the previous year. Large sums have been spent annually for many years past for the improvement of properties. Nearly all of these improvements have operated to reduce the cost of production. In addition to this, plants are efficiently operated in every respect and costs are believed as low as those of competitors.

As of May 1, 1928, the company purchased and took over the property at Phoenixville (near Birmingham), Ala., formerly owned by the Phoenix Portland Cement Corp. This property is designated the "Morton plant." Its operations for the year were about in accord with expectations. In order to partially finance this property, 118,500 shares of unissued common stock were sold. In addition to the capital charge, due to the purchase of the Morton plant, there were other charges to capital, during the year, of $1,009,396.52.

This sum was used in the main for the following improvements which were completed: At Martins Creek, Penn., No. 4 plant, rearrangement of raw end whereby raw material for both plants at Martins Creek is produced at No. 4; erection of a Cottrell precipitator to collect the dust from the stone dryers and the raw material mills, conveyors and elevators; installation of a wash and change house. At Manheim, W. Va., plant, installation of vertical coolers and a rearrangement of clinker elevators and conveyors. At La Salle, Ill., plant, installation of a fifth clinker grinding mill with a dust-collecting system for all clinker grinding mills.

Further, there was started at the Cementon, N. Y., plant the erection of modern silos for the storage of cement. The construction program for 1929 includes the erection of a Cottrell precipitator at Martins Creek, Penn., No. 4 plant to collect the dust from the kilns and the company is erecting an overhead clinker crane with storage and gypsum mixing plant at Ironton, Ohio, plant, also remodeling the kilns at Martins Creek, Penn., No. 4 plant. There are other improvements contemplated.

Based upon reports from the company's own field organization and from various statistical organizations, to whose reports it has access, it is felt that the company will have a satisfactory demand in 1929.

CONDENSED SUMMARY OF INCOME AND SURPLUS OF THE ALPHA PORTLAND CEMENT CO.

(For the Years Ended December 31, 1928 and 1927)

	1928—December 31	—1927
Net sales	$13,546,627.63	$13,529,328.37
Operating expenses*	10,787,376.53	10,947,687.53
Profit from operations	$ 2,759,251.10	$ 2,581.640.84
Miscellaneous income—net	181,283.87	147,645.11
Net income for the year before provision for federal income taxes	$ 2,940,534.97	$ 2,729,285.95
Provision for federal income taxes (estimated)	355,000.00	370,000.00
Net income for the year	$ 2,585,534.97	$ 2,359,285.95
Surplus at beginning of the year	5,009,058.78	4,567,272.83
Gross surplus	$ 7,594,593.75	$ 6,926,558.78
Profit and loss charges:		
Dividends:		
On preferred capital stock	$ 140,000.00	$ 140,000.00
On common capital stock	2,044,125.00	1,777,500.00
Profit and loss adjustments	237,000.00	....
Total	$ 2,421,125.00	$ 1,917,500.00
Surplus at end of the year	$ 5,173,468.75	$ 5,009,058.78
*Including: Depreciation and depletion	$ 1,267,539.27	$ 1,193,831.01
Maintenance and repairs	1,103,205.18	1,283,912.05

CONDENSED CONSOLIDATED BALANCE SHEET OF THE ALPHA PORTLAND CEMENT CO.

(December 31, 1928 and 1927)

ASSETS

	1928—December 31	—1927
Current assets:		
Cash	$ 2,585,988.03	$ 2,645,904.75
Call loans	2,800,000.00	1,500,000.00
United States Liberty Loan bonds, Treasury certificates, etc., at cost	1,357,975.44	1,732,975.44
Working funds and advances	186,744.43	123,530.84
Accounts and notes receivable, deemed good and collectible	557,110.27	380,018.39
Inventories—Finished cement, sacks, materials, and supplies, based on physical inventories and lower of cost or market)	2,848,269.58	3,022,834.69
Total current assets	$10,336,087.75	$ 9,405,264.11
Miscellaneous investments, at cost	$ 212,166.25	$ 168,352.50
Property:		
Land, buildings, machinery, equipment, and coal mine lease	$32,341,326.44	$27,571,302.64
Less reserves for depreciation, depletion, etc.	9,788,555.85	8,521,016.58
Net property	$22,552,770.59	$19,050,286.06
Deferred items:		
Work in process	$ 328,074.47	$ 308,248.35
Prepaid expenses	38,988.92	29,552.76
Total deferred items	$ 367,063.39	$ 337,801.11
Total	$33,468,087.98	$28,961,703.78

CONDENSED CONSOLIDATED BALANCE SHEET OF THE ALPHA PORTLAND CEMENT CO.

(December 31, 1928 and 1927)

LIABILITIES

	1928—December 31	—1927
Current liabilities:		
Accounts payable	$ 447,722.80	$ 557,998.05
Wages payable	46,955.61	72,007.98
Federal income and general taxes (estimated)	404,474.83	409,816.91
Dividend payable January 15, 1929	533,250.00	444,375.00
Total current liabilities	$ 1,432,403.24	$ 1,484,197.94
Reserves:		
Compensation and other insurance	$ 596,950.08	$ 569,562.37
Miscellaneous	130,765.91	148,884.69
Total reserves	$ 727,715.99	$ 718,447.06
Capital stock:		
Preferred 7% cumulative (authorized and outstanding, 20,000 shares of $100 each)	$ 2,000,000.00	$ 2,000,000.00
Common—Without par value (authorized, 1,000,000 shares; issued and outstanding—1928, 711,000 shares; 1927, 592,500 shares)	24,134,500.00	19,750,000.00
Total capital stock	$26,134,500.00	$21,750,000.00
Surplus	$ 5,173,468.75	$ 5,009,058.78
Total	$33,468,087.98	$28,961,703.78

Book Reviews

Cement Limes and Plasters

CEMENT, LIMES AND PLASTERS, by Edwin C. Eckles, third edition. Published by John Wiley and Sons, New York. 700 pp., 269 tables, 158 illustrations.

THE primary object of the first two editions of this volume was to provide a summary of the extensive literature on cementing materials. The term is used in its broadest sense and includes plasters, limes and hydraulic cements. The author, in the third edition attempts to carry out this basic principle and discusses as well, the various phases of composition, sources of raw material, physical and chemical properties of the raw and the finished cements.

This edition, outside of the last chapter dealing with alumina cements and high-strength portland cements contains very little new material. With present day methods and technique in the lime and plaster industry considerable value could have been added to the book by bringing the portions dealing with those subjects up to date.

The last 43 pages of the book deal with the comparatively new alumina and accelerated cements and is a subject with which Mr. Eckles is very familiar and his statements can be relied upon as being authoritative. In this chapter he defines alumina cements and compares their analysis and properties with portland, natural and slag cements. The sources of material for this type of cement and an analysis of the principal sources of alumina and bauxite, is well covered.

Alumina cement contains from 65 to 90% of calcium aluminate, the remaining 10 to 35% being iron and silica. A certain amount of each of these is necessary to aid fusion and to regulate the setting time of the finished product. The cement is made today commercially in various types of shaft furnaces by a fusion of the bauxite ore with calcareous material, this latter product usually being in the form of limestone. The melted product is cooled rapidly and ground to a fine powder. These features are discussed in detail. The author points out the difficulties of manufacture of high-alumina cement in a rotary kiln due to the high temperature necessary and the fact that the fine grinding necessarily causes an intimate and easily fusable mixture. This contrasts with the blast-furnace-type method of manufacture where coarse ore can be fed with the fuel. He points out the difficulties due to the narrow limits between temperature of clinker formation and that of fusion. This condition coupled with the short time in the kiln, which is insufficient for proper reduction of the silica and iron in the charge, has caused the rotary kiln to be looked on with disfavor. High fuel cost is another objection to the use of rotary kilns. The final paragraphs of the chapter outline the properties and uses of this cement.

The last chapter deals with the accelerated portland cements or high early-strength portland and denotes a pure portland type which is given extremely rapid hardening and high early strength properties by care in manufacture and without the addition of extraneous material other than gypsum. The accelerated portland cements give strengths at 2 to 3 days that with ordinary portland cement requires 28 days to obtain. These high strengths are maintained for years.

Mr. Eckles lists the requirements of raw materials necessary for perfect combination and minimum costs as being (a) low magnesia limestone, (b) more silicious clays and shales, (c) addition of silica, if necessary, (d) slowing rising lime percentages along with need of a pure high lime-silica stone, (e) necessity of fine grinding raw material, (f) increased use of gypsum.

He summarizes the manufacturing requirements for the accelerated cement under four heads: (1) Securing the most favorable physical and chemical condition and composition of the raw mix. (2) Operating the furnace to gain the optimum conditions of burning and cooling. (3) Grinding so as to increase the percentage of impalable powder in the finished cement. (4) Burning must be conducted to production of large crystals as only broken crystals in cement offer the active element.

He further points out that all of these conditions may not be necessary to produce an accelerated cement, since under favorable conditions, one factor may be sufficient, and consequently the mixture must be studied with respect to its physical and chemical composition. Tables showing the tensile and compressive strength as compared to ordinary portland cement, are included.

The Chemistry of Silica

Reviewed by R. H. BOGUE

THE PROPERTIES OF SILICA, by Robert B. Sosman. American Chemical Society Monograph No. 37. 856 pages. The Chemical Catalog Co., Inc., New York.

THIS is probably the most exhaustive treatment that has ever been presented in a single treatise on the science of a single chemical substance. It is not alone a compilation of experiment and hypothesis and law gleaned from a painstaking study of the literature. The lifelong application of the author to the analysis of the minutae in the revelations of almost countless researches on the structure of the earth has placed him in a position peculiarly adapted to the correlating of all scientific information which bears on the substance silica. The book is written in a delightful human vein, but is understandable in its entirety only to the specialist. It is perfectly certain, however, that the layman who is keenly interested in the subject will find a world of pleasure and enlightenment by a leisurely perusal of its meaty pages.

Following an introductory chapter on the properties of a substance, the author enters upon a preliminary discussion of the composition and atomic structure of silica. This subject of structure is left incomplete while eight chapters are introduced on the various known phases of silica and the conditions governing their transformations. These include sluggish inversions, the high-low inversions, the melting and vaporization, complex phases, the effects of subdivision and twinning and the micro-forms.

Seven chapters then follow which have to do primarily with the development of a general theory of the structure and polymorphism of silica. This series is in reality the heart and core of the whole work, and into it the author has put his greatest creative effort. The skeleton of the theory is summarized by the author as follows:

It is believed that the silica atom-triplet maintains some degree of individuality in its amorphous and crystalline states. The freedom of its oxygen atoms to change their positions with respect to the silicons is restricted, as is shown by the impossibility of changing right-quartz into left-quartz. The triplets are assumed to assemble into chains or threads in the liquid and glassy states, and a thread structure may persist in the crystalline states. The three principal crystalline forms (cristobalite, tridymite, quartz) are built up by combining the threaded triplets in three different ways, the connection between threads being through the external electrons of oxygn and silicon atoms.

The high-low inversions in all the three forms are thought to be due to the same underlying mechanism, namely, a change in the state of motion of certain electrons, resulting from the change of thermal vibration of the atoms with temperature, whereby the shape of the silica triplet and the relative positions of two atoms are suddenly altered as a result of the passage of the system through a stage of instability.

The variability of the inversion-temperature of cristobalite is thought to be due to the existence, in varying proportion, of atoms in random or undefined positions within a structure which is as a whole orderly or crystalline.

The properties of vitreous silica and of silicate glasses in general are assumed to depend upon the existence within such glasses of two types of structure, namely, a coarse structure depending upon the mechanical history of the fragment under consideration, and a finer structure, superposed on the first, depending upon the thermal history of the fragment.

Following this development of a theory

of structure and polymorphism there are presented three chapters on thermal energy, four chapters on mechanical energy, four chapters on silica in the electric and magnetic fields, and eleven chapters on silica in the periodic electromagnetic field. These consider such subjects as the thermal changes in volume and shape, the elastic properties and surface energy, the piezo-electric and pyro-electric properties, the refraction, rotary power, reflection, absorption and emission, the radiational properties, and the electro- and magneto-radiational properties of silica.

Seven short chapters on the applications of the facts to various branches of natural science and technology constitute the last section of the book. In explaining the brevity of this section, the author says: "A few selected examples should be sufficient, however, for if the facts and principles have been successfully presented, the reader is better qualified to make applications to his own problems than is the author." These seven chapters are entitled as follows:

- Geological applications.
- Silica minerals and rocks.
- Industrial applications of silica.
- The manufacture of viterous silica.
- Silica refractories.
- Chemical uses of silica.
- Physical uses of silica.

Among the industrial applications of silica are listed the use of quartz sand and gravel in cement concrete, mortar and other constructional work, glass, refractories, pottery, abrasives, transparent vitreous silica for chemical and optical apparatus, quartz crystals for use in piezo-electric oscillators, soluble silicates, filter beds, adsorbing media, manufacture of ferrosilicon and carborundum, fine thread suspensions, insulation, and a number of others. All of these, however, are but lightly touched upon, for the great effort in the work is the orderly presentation of fundamental facts and the development of an adequate theory.

New Treatise on Chemical Engineering

Reviewed by J. R. WITHROW

A TREATISE ON CHEMICAL ENGINEERING, by Goeffrey Martin. Published by Crosby, Lockwood and Sons, Stations Hall Court, Ludgate Hill, E. C. 4, London.

IN 1921, when Geoffrey Martin, consulting chemical engineer and the author of the book entitled "A Treatise on Chemical Engineering," was appointed Director of Research to the British Portland Cement Association he found a great need for more accurate and more easily available technical information, especially with regard to the natural laws covering the flow of liquids and gases. He found scattered through the textbooks a mass of disjointed, emperical formulae, most of which was conflicting and in most cases applicable only to a single fluid and under very limited physical conditions. For this reason he prepared this treatise, the object of which is to provide the chemical engineer, mechanical engineer and works chemist with scientific means for calculating the flow of liquids or gases of all kinds under all practical conditions.

The author, in the preface, points out that many scientific articles are so buried in deep mathematical formulae that the average engineer has not the time, and, in most cases, lacks the ability to translate the information to his use. The author points out that some supposedly recent amazing advances in engineering information that are just beginning to filter down to the ordinary engineer were, in some cases, data predicted mathematically 70 years ago and verified experimentally 25 years later.

In this book the author has done a real service to the engineering profession by the compilation of these data. A full discussion of the laws of gas flow is given and what is more important, illustrations and practical examples of how to apply these laws to the various engineering problems connected with the cement industry are included.

The tables given are unique and elaborate and the author claims that the data collected in this volume is the most complete on the subject published in any language. A considerable amount of material is given on the subject of dust settlement in industrial operations, the separation of materials of different size or of different shape and specific gravity and the pneumatic transporting of granular material.

The 31 chapters of the book are well illustrated. The author is one of a few scientific writers who is able to grasp the fact that he stands in mathematical and scientific attainment far above the usual reader and hence he comes down to earth, one might say, and prepares a book that will be widely read and used by industrial engineers.

Excavating Machinery

Reviewed by EDMUND SHAW

EXCAVATING MACHINERY, by W. Barnes. Published by Ernest Benn, Ltd., Bouverie House, E. C. 4, Fleet street, London.

THE development and application of excavating machinery as exemplified by power shovels, drag lines and grabbing or clam shell cranes is one of the outstanding features of this mechanized age. Improvements are being made so rapidly that the purchaser of new equipment of this type has to do considerable literary research work to keep up with the new and different machines. W. Barnes, mechanical engineer of London, has written a very thorough treatise on exexcavating equipment.

The book is thoroughly modern, up to date and profusely illustrated. The subjects are treated under the heading of fundamental principles of design, historical development, detailed description of the various types, construction details, applications to classes of excavating work and hints to users with other miscellaneous information.

Under historical development the author describes and illustrates the different stages in the evolution of the steam shovel starting with the first Otis shovel patented in 1834, through the later, separate-engined type of movement. He traces the progress in size of bucket, gross weight and lifting capacities from the smaller shovels to the present Mogul types. He also shows the development of the electric and Diesel-electric shovels.

In another chapter he describes the different types of shovels and includes full circle shovels, universal or combination excavators, drag lines, long-jib full-circle shovels, railroad types, grab or clam shell machines, electrically-operated shovels, internal combustion machines and closes with hydraulic and air operated machines.

He describes in detail the carriage travelling motion which includes flanged wheel travelling gear, traction wheel, skids, and caterpillars. The revolving frame, slewing and racking motions, engines, clutches, boilers, super-heaters and miscellaneous mechanical features are described in detail and amplified by numerous cuts and diagrams.

Chapter IV outlines the types of excavators that are used on the different kinds of work. Trench digging, railroad work, irrigation, drainage, sand and gravel operations, and quarries (both deep and shallow) all have equipment peculiar to the different class of work. This chapter as well as the one that follows is especially helpful to one who is about to buy shovel equipment and desires advice as to the best type to obtain.

He classifies and discusses at considerable length the different items to be taken into account when considering the type of excavator to use, such as working heights of shovel, nature of material, capacity of bucket, power requirements, design and operating methods. The last three chapters of the book are devoted to hints to purchasers, hints to operators, a description of auxiliary equipment and tabulated engineering information.

Canada Mineral Resources

BULLETIN No. 687, entitled "Investigations of Mineral Resources and the Mining Industry, 1926," of the Canada Department of Mines, Mines Branch, John McLeish, Director, has been published at Ottawa, Ont. It contains 14 chapters on the mineral resources of the dominion, eight of which deal with the nonmetallic industry.

The nonmetallic resources of Canada including asbestos, feldspar, graphite, soapstone, gypsum, limestone and granite are discussed briefly in separate chapters. Two chapters are devoted to preliminary reports on the limestones of Nova Scotia and are covered under separate sub-heads according to their geological classification. Similar deposits of the Gaspe Peninsula are likewise

The Canada Department of Mines publishes numerous bulletins and reports which would prove helpful to rock products producers in the Dominion.

Foreign Abstracts and Patent Review

Some Observations on the Shrinkage of Cements—Researches touching on this subject have been made by Anstett, Magnel, O. Graff, Bates and others, and recently J. Cocagne and Y. Matras have reported their observations of the phenomena of shrinkage to the International Technical Congress of Masonry and Reinforced Concrete. These observations were obtained in a systematic study of uniformly and identically prepared bricks of neat cement and of mortar mixture prepared with portland cements produced in vertical kilns, portland cements produced in rotary kilns, "super-cements" produced in rotary kilns, and alumina cements, and kept under constant laboratory temperature of 17 to 18 deg. C. (62.6 to 64.4 deg. F.) and nearly constant atmospheric humidity. The shrinkage of the samples was determined at intervals of 1, 2, 3, 7, 28, 90, 180 and 360 days with a micrometer gage in mm. per m. and recorded simultaneously in tables and charts, first of neat cement in respect to the different types of cement; in respect to the influence of the proportion of water in the mix, and in respect to the influence of the storage in air or water.

These tests indicated that there is less shrinkage with less water in the mix, and an expansion with consequent shrinkage if the mix is stored in water. Secondly, the tests were of mortar mix in respect to different proportions of cement and aggregate, as to richness in cement and the medium of storage, and in respect to the influence of the proportion of water in the mortar mix. Thirdly, the tests were of cement and mortar mixes prepared with portland "super-cement" with different percentages of sodium silicate, or of sodium carbonate, and prepared with portland "super-cement" and also with portland cement with different percentages of calcium chloride, all tests showing increased shrinkage with increase in percentage of the chemicals.—*Revue des Materiaux de Construction et de Travaux Publics* (1928) 228, pp. 321-330. Same article appeared in *Ciment* (1928) **33**, 6, pp. 232-236 and in *Science et Industrie* (1928) pp. 89-94.

Cement Improvement—Concrete Improvement—H. Richarz discusses a few problems important for practical work, considering concrete, its raw materials, cement, aggregates and water and their preparation, in which the bettering of cements comes under *cement improvement,* and developments in conditions and use of aggregates, and mixing water and the methods of concrete mixing under *concrete improvement.* After briefly describing the manufacture, composition and development in standard cements, the author presents the two purposes in cement improvement as being the improving of the qualities of the cements in general, and the making suitable of cements for certain specific applications. The history of the attempts to improve the qualities of different cements by various suitable and unsuitable methods or additions is reviewed, the references given dating back to 1879.

Table I (below) gives the average values of fineness, tensile and compressive strengths obtained each year in the general testing of cements by the laboratory of the Society of German Portland Cement Manufacturers for normal portland cement for the years 1902 to 1926, showing incidentally the improvements made in the manufacture of cement due to developments in pulverizing and burning equipment, which resulted in a finer mix and a better burn, conducive to a more intensive chemical combination of the individual components and also a finer cement, which acquired thus an increasing reaction ability with the mixing water. In reference to the improvement of cements for specific applications, if resistance to sea water and elasticity are preferable to high strengths, trass is the improving medium; and there are other improving admixtures or special formula cements. But the most important subject, that of concrete improvement, namely, the most careful selection and correct quantitative use of the concrete aggregates, besides the correct proportioning of water and suitable handling of concrete, is discussed in the third installment.—*Zement* (1928), **17**, 36, pp. 1348-51; 37, pp. 1377-82; 38, pp. 1411-14. R. Meuser answers H. Richarz's respective statements concerning trass.—*Zement* (1928), **17**, 42, pp. 1540-1542.

Lime-Burning Processes—The series of articles on German lime kilns which appeared recently in ROCK PRODUCTS from the pen of V. Azbe are reviewed by H. Laeger. Speaking of the scarcity of mixed-fired kilns in the United States and the disregard of the slight discoloring of the burnt lime from the mixed-feed kilns by the Europeans, H. Laeger states that "the American consumers are in this respect excessively spoiled and give to the color of the lime an importance which it does not deserve in most cases." Further on he states: "Azbe's occasional notes that no poking and grate cleaning is required by a mixed-feed kiln are very easily understandable by one who knows American kilns of even latest design." After reviewing the description of the Rheinisch-Westphalischen Kalkwerke, H. Laeger states: "It has not yet become known to Azbe that the rotary grate shaft kilns at another place have a daily output of 120 to 150 tons of sinter dolomite per shaft, at a fuel consumption of 27% coke.—*Tonindustrie-Zeitung* (1928) **52**, 84, pp. 1675-76.

Experiments With Test Specimens of Neat Cement—In connecting to similar experiments by Prof. Kuehl, A. Dahlgren used small cylindrical test specimens of neat cement, such as are required for the volume consistency test, according to Le Chatelier; and he determined the compressive strength in 7-cm. (2.8-in.) cubes mixed in the proportion of 1:3. The relations of the test results after 7- and also after 28-days were a ratio of 1.6 to 1. There was obtained, also by the use of various cements, a good correspondence of the above-named relation, or values. In the testing of a high grade cement in comparison to a normal cement after 12 and 24 hours, it could be determined after 12

TABLE I.—AVERAGES OF ANNUAL TESTS SHOW IMPROVEMENT OF GERMAN STANDARD PORTLAND CEMENTS

Year	Screen Residue*		Tensile Strength†			Compressive Strength†		
	900-mesh	5000-mesh	7-W	28-W	28-K	7-W	28-W	28-K
1902	1.5	23.0	......	22.4	......	......	243	......
1903	1.4	22.7	......	21.8	......	......	245	......
1904	1.4	22.4	......	21.5	......	......	247	......
1905	1.9	17.0	......	21.6	......	......	243	......
1906	1.8	19.8	......	25.5	......	......	251	......
1907	1.6	20.9	......	23.7	......	......	231	......
1908	1.3	21.6	......	24.5	......	......	246	......
1909	1.4	20.1	......	25.4	39.9	198	289	351
1910	1.2	19.4	......	26.9	40.9	198	294	351
1911	1.0	18.7	......	27.4	40.7	208	299	360
1912	1.0	17.3	......	27.3	40.5	218	318	378
1913	0.9	16.0	21.5	27.3	40.6	217	312	377
1914	0.7	14.5	22.5	28.1	41.6	235	337	393
1915	0.8	14.0	23.5	28.6	43.3	241	358	418
1916	0.7	13.7	24.5	30.5	43.8	262	375	432
1917	0.7	15.2	22.5	27.9	40.5	244	345	403
1918	0.6	14.6	21.5	26.3	38.8	243	345	398
1919	0.7	13.4	21.7	26.8	40.4	223	319	380
1920	0.7	13.9	21.7	26.8	40.5	230	325	389
1921	0.6	14.0	21.4	27.5	41.0	234	335	399
1922	0.8	15.6	23.1	29.1	43.1	226	321	390
1923	1.0	16.6	20.7	26.5	39.9	217	296	372
1924	0.5	14.3	23.6	31.3	40.9	235	344	382
1925	0.6	13.6	25.1	31.3	41.7	267	370	438
1926	0.5	13.0	24.7	30.4	41.3	281	384	460

*900- and 5000-mesh per sq. cm. is 75- and 176-mesh per sq. in.
†Kg. per sq. cm. is 14.223 lb. per sq. in.

hours which cement was high grade. This determination was especially valuable, since it can be carried out with small quantities.—*Revue des Materiaux de Construction et de Travaux Publics* (1928) 224, p. 177.

What Can the German Lime Industry Learn From America In Its Endeavors Towards Rationalization?—This problem was dealt with by Paul Ludowigs at the principal meeting of the Association of German Lime Plants on February 22, 1929, in which it was stated that the superiority of the American lime plants shows itself only in the quarrying and preparation of the rock, whereas in the burning operation Germany compares more favorably, since German lime kilns are developed further, as well in efficiency as in the economy of heat.—*Tonindustrie-Zeitung* (1929) **53,** 22, p. 449.

The Suitability and Economy of a Cement-Burning Kiln—H. Stehmann reviews the testing of cement kilns by the kiln commission of the German Association of Cement Manufacturers with special reference to the rotary kiln equipped with the Stehmann burning system. He shows why this kiln did not produce better results than those obtained and suggests that in future tests various sources of possible losses be checked, such as high waste gas temperatures, hot clinker at the kiln discharge, unsuitable coal, incomplete burning; and that a heat balance of the kiln would be useful; concluding then with an enumeration of the advantages of the Stehmann system.—*Zement* (1929, **18,** 9, pp. 256-9; *Tonindustrie-Zeitung* (1929) **53,** 17, pp. 333-5.

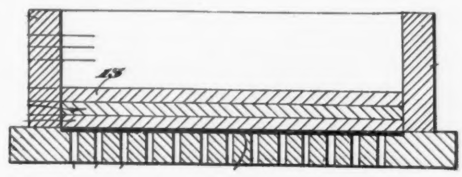
Volumetric Determination of Lime in Cements—W. Melzer replies to the article by Rissel (*Tonindustrie-Zeitung*, 1929, **53,** 6, p. 105) stating among other criticisms that the determination of the lime in the raw flour by use of bromthymol as indicator, therefore in a material of high lime content and low magnesia content, can be carried out directly with the Pierce-Setzer-Peters method as modified by Melzer (*Tonindustrie-Zeitung*, 1928, p. 1464); and in commenting upon the increased interest of the rapid determination of lime in raw flour, he states that, independent of the method of manipulation, it is actually the only usable means for supervising the mixing process in the manufacture of cement steadily and rapidly.—*Tonindustrie-Zeitung* (1929) **53,** 18, p. 358.

The American Lime Industry in 1928—Laeger reviews the data published in Rock Products, 1928, No. 24, and states that this periodical gives high estimates in reference to the prices, while actually the prices obtained were frequently considerably lower according to information given the author in his visit to the United States. Reviewing the reasons for the regression in the lime business, he states that this periodical reflects the events frankly.—*Tonindustrie-Zeitung* (1929) **53,** 18, pp. 357-8.

Recent Process Patents

The following brief abstracts are of current proces. patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Governmen. Printing Office, Washington, for each patent desired.

Method of Making Asbestos-Cement Sheets—This patent describes a method of making fiber-concrete sheets of thicknesses that heretofore have been considered impracticable. The author points out that where asbestos-cement mixtures for manufacture of asbestos sheets is used with a solids to water ratio of 3 to 1 or less that the mixture was unsafe and not uniform be-



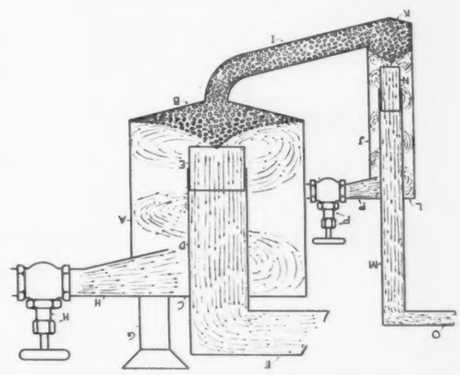
Successive layers of asbestos and cement subjected to filtration and pressure to make sheets

cause of a decided tendency for the mixture to become non-homogeneous. By increasing the water content to a 4 to 1 ratio satisfactory results can be secured, especially if a mixture of this proportion is used in connection with the patentee's process.

His process consists in essence of building up a layer of asbestos-cement on a suitable filter. The filtering operation temporarily is stopped when this layer has been built up to the desired thickness with maximum filter pressures of about 100 lb. per sq. in. Following the first layer any number of similar layers can be built on top of the first until a cake of the final thickness is obtained. At that point means are provided for subjecting the cake to a pressure of 4000 lb. per sq. in. and all excess water squeezed out of the mass.

The author claims that owing to each layer being a porous filter media that of each succeeding batch of asbestos concrete is more or less carried into the other. This should prevent laminated structures.—*John C. MacIldowie, assignor to Asbestos Wood and Shingle Co.* U. S. Patent No. 1,708,842.

Wet Centrifugal Separator—A separator, which may be used for removing coal from slate or sand from lignite or trash and for similar work, employing the same centrifugal and lifting current effects that are used in air separators, has been recently patented. The cut shows a diagramatic form. The feed enters the larger vessel, which has a closed top, and falls into a vortex created by the water coming through the larger valve. The vortex causes the material to assume a conoidal form with the lighter material (coal) on top, and this lighter material is drawn out by the upward current in a central pipe. The heavier material (sand) flows downwardly through a tube to a smaller vessel in which is another vortex, which arranges the sand in conoidal form below a pipe through which it is drawn out by the upward current. By balancing the strength of the two vortical currents the discharges are regulated so that sand and coal are taken out separately at the same rate as that at which they are fed together.



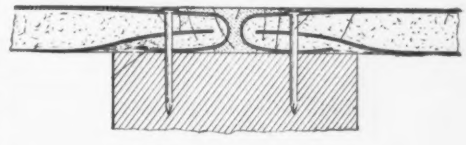
Wet centrifugal separator for removal of trash from sand

In the actual machine the sand vortex and discharge are inside of the vessel which receives the feed. The machine should make a close separation (judging it from the theoretical principles involved), but it has the disadvantage of discharging both products with a great deal of water.—*Richard F. Grant, Edward B. Worthington and William L. Jacobus.* May 15, 1928. Patent No. 1,669,820.

Marble Plaster—The author of the patent proposes to produce a hard gypsum plaster by subjecting the wet mixture to a pressure of 100 to 500 kg. (1420 to 7300 lb./in.^{2}) per sq. cm., thereby squeezing out the excess water required to bring the stucco to working consistency.

The patentee claims that plaster treated in this manner is not hygroscopic and is very hard and compact. These last two properties make it possible to polish the set plaster. —*Louis Emile Chassevent, Paris, France.* U. S. Patent No. 1,703,097.

Plaster Board—The patentee describes a wallboard consisting of an upper and lower paper, the space between filled with any cementatious material, and with the lower paper wider than the top or cover



Folded-edge wallboard

sheet. The lower sheet is so folded at the edges that no paper edge is exposed outwardly and also folded so as to secure a slightly, beveled edge. The patent claims covering this wallboard, filed in July, 1919, were granted in February, 1929. *M. K. Armstrong, assignor to United States Gypsum Co.*, U. S. Patent No. 1,701,291.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended May 4	Limestone Flux Week ended May 11	Sand, Stone and Gravel Week ended May 4	Sand, Stone and Gravel Week ended May 11
Eastern	3,550	3,560	11,407	12,614
Allegheny	3,541	3,937	6,691	7,857
Pocahontas	493	524	991	1,100
Southern	503	507	8,487	9,208
Northwestern	1,104	1,387	6,283	8.031
Central Western	534	549	10,400	12,147
Southwestern	485	533	6,340	6,377
Total	10,210	10,997	50,599	57,334

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1928 AND 1929

District	Limestone Flux 1928 Period to date May 12	Limestone Flux 1929 Period to date May 11	Sand, Stone and Gravel 1928 Period to date May 12	Sand, Stone and Gravel 1929 Period to date May 11
Eastern	42,844	50,633	84,253	83,950
Allegheny	55,866	57,284	75,612	68,950
Pocahontas	5,763	5,539	12,519	9,929
Southern	10,219	8,710	179,591	141,007
Northwestern	16,060	14,810	61,649	50,273
Central Western	7,596	9,663	133,544	127,815
Southwestern	7,524	8,046	94,466	99,052
Total	145,872	154,685	641,634	580,976

COMPARATIVE TOTAL LOADINGS, 1928 AND 1929

	1928	*1929*
Limestone flux	*145,872*	*154,685*
Sand, stone, gravel	*641,634*	*580,976*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning June 1:

SOUTHERN FREIGHT ASSOCIATION DOCKET

45454. **Phosphate rock,** from points in Mt. Pleasant, Tenn., district to points in Oregon, Washington, British Columbia and Idaho taking Groups 1, 2 and 3 in Agent Toll's I. C. C. 1211. In lieu of rate of 2100c per net ton, it is proposed to establish rate of 1845c per net ton on phosphate rock, carloads. The suggested rate is made on basis of Memphis, Tenn., combination.

45473. **Phosphate rock,** from Mt. Pleasant-Centreville, Tenn., district to Milwaukee Electric Railway and Light Co. stations. Class or combination rates now apply. Proposed rate on phosphate rock, crude lump or phosphate rock, crude ground, in bulk or in bags, carloads, minimum weight 30 tons of 2000 lb., from all origins taking Group 1 in L. & N. R. R. I. C. C. A15803 to above named stations, 504c per net ton, same as rate in effect to Milwaukee, Wis.

45515. **Limestone,** from Ladds and Portland, Ga., to McComb, Miss. Combination now applies. Proposed rate on limestone, ground or pulverized, carloads, minimum weight marked capacity of car except when cars are loaded to their full visible capacity actual weight will govern, from Ladds and Portland, Ga., to McComb, Miss., 261c per net ton, same as rate approved under Submittal 41294, from the origins in question to Brookhaven and Vicksburg, Miss.

45541. **Limestone, ground,** for agricultural purposes, between points on the L. & N. R. R. in Kentucky, on the one hand, and stations on the Glasgow Ry., on the other. It is proposed to provide for rates on ground limestone, for agricultural purposes, in open top cars, carloads, between points on the L. & N. R. R. in Kentucky, on the one hand, and stations on the Glasgow Ry., on the other (intrastate only), the same as on crushed stone.

45552. **Gravel,** from Puddledock, Petersburg, Hopewell, Twohy Siding, Ellerslie and Warmore, Va., to N. S. R. R. stations in North Carolina. It is proposed to establish through rates on gravel, carloads, minimum weight 100,000 lb. (when 90% of marked capacity of car is less than 100,000 lb. such 90% of marked capacity will apply as minimum), except when cars are loaded to their visible capacity, actual weight will govern, from the above-named origins to all stations on the Norfolk Southern R. R. in North Carolina.

Rates in cents per net ton. Rates from and to representative points are shown below:

From Puddledock, Va., to Moyock, N. C., Elizabeth City, N. C., 150c; Stantonsburg, N. C., 160c; Cairo, N. C., 165c.

From Petersburg, Va., to Moyock, N. C., Elizabeth City, N. C., Stantonsburg, N. C., 150c; Cairo, N. C., 165c.

From Ellerslie, Va., Warmore, Va., to Moyock, N. C., Elizabeth City, N. C., 150c; Stantonsburg, N. C., 160c; Cairo, N. C., 165c.

From Twohy Siding, N. C., to Moyock, N. C., 150c; Elizabeth City, N. C., 160c; Stantonsburg, N. C., 165c; Cairo, N. C., 170c.

Note 1—Minimum weight marked capacity of car.
Note 2—Minimum weight 90% of marked capacity of car.
Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

45575. **Limestone or marble, ground or pulverized,** carloads, change in commodity description as published in Southern Ry. Limestone Tariff, I.C.C. A10119. It is proposed to amend description in Southern Ry. Limestone Tariff, I. C. C. A10119, applicable on limestone or marble, ground or pulverized, carloads (See Note 1), except when car is loaded to full visible capacity actual weight will govern, to be as follows:

Limestone or marble, ground or pulverized, carloads (See Note 1), except when car is loaded to full visible capacity actual weight will govern (See Note A). Where reference is made to this item the carload minimum weight on ground or pulverized limestone or marble will be marked capacity of car ordered, except when cars are loaded to their full visible capacity actual weight will govern, but not less than 67,000 lb.; in such instances the billing should carry certificate over agent's signature, "Car of less capacity not available." Proposed in order to comply with requirements of Rule 66 of I. C. C. Tariff Circular 20.

Note A—Minimum carload weight when the capacity of car furnished is greater than that of car ordered.

SOUTHWESTERN FREIGHT BUREAU DOCKET

17540. **Agricultural limestone,** from points in Arkansas to points in Missouri and Arkansas. To establish the following distance scale of rates for application on agricultural limestone (for fertilizing purposes only), carloads (See Note 1), but not less than 80,000 lb., from Ruddells and Batesville, Ark., to points on the Mo. Pac. R. R. in Arkansas and Missouri:

Distance	Rates
20 miles and under	3
40 miles and over 20	3½
80 miles and over 40	4
120 miles and over 80	5
160 miles and over 120	6
220 miles and over 160	7

There is a supply of this commodity at Ruddells and Batesville, Ark., and the rates proposed, it is stated, are as high as can be used in the distribution of this fertilizer. The rates proposed are also in effect at points on the M. & N. A. R. R.

17562. **Stone,** from Carthage, Mo., to Tulsa, Okla. To establish a rate of 7c per 100 lb. on stone, broken, crushed or ground, carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., from Carthage, Mo., to points in Oklahoma. The proposed rate is in effect via other routes, as per Item 535, Mo. Pac. R. R. Tariff 2379L, also in St.L.-S.F. Ry. Tariff 3165D, and it is desired to meet this rate via Mo. Pac. R. R., Okay, Okla., K. O. & G. Ry., Muskogee, Okla., Midland Valley R. R.

17574. **Limestone,** between points in Arkansas. To establish the following distance scale of rates on limestone, crushed or ground, having value for soil fertilization purposes only, carloads, minimum weight 80,000 lb., or if marked capacity of car is less than 80,000 lb., marked capacity will govern, for application between points in Arkansas, on intrastate traffic (rates in cents per ton of 2000 lb.):

Miles	Prop.	Miles	Prop.
10	50	140	115
20	50	150	115
30	50	160	115
40	50	170	120
50	55	180	125
60	65	190	130
70	70	200	135
80	75	210	140
90	85	220	140
100	90	230	150
110	95	240	150
120	100	250	155
130	110		

It is stated that there is a widespread interest in the use of limestone for fertilization purposes, and that the proposed rates are the same as prescribed by the Missouri Public Service Commission, and are 20c per ton less than the sand, gravel and crushed stone scale.

17581. **Broken stone,** from Memphis, Tenn., to Tulsa, Okla. To establish a proportional rate of $3 per ton of 2000 lb. on stone, broken, carloads (See Note 2), from Memphis, Tenn., on traffic originating points east of the Mississippi River, to Tulsa, Okla. Interested shippers state they desire to move considerable stone from points beyond Memphis, Tenn., to Tulsa, Okla., but are unable to do so on basis of present rate of $3.90 per net ton.

WESTERN TRUNK LINE DOCKET

6894. **Stone, rubble,** carloads, minimum weight 50,000 lb., from Denver and Lyons, Colo., to Lincoln, Neb. Present, 19½c per 100 lb.; proposed, 18½c per 100 lb.

CENTRAL FREIGHT ASSOCIATION DOCKET

21655. To establish on **sand, viz., blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica,** carloads, Erie, Penn., to Oil City, Penn., rate of 139c per ton of 2000 lb. Present rate—135c per ton of 2000 lb., published in P. R. R. Tariff I. C. C. G. O. 14850; 139c per 2000 lb., published in B. & L. E. R. R. Tariff I. C. C. 904.

21657. To establish on **crushed stone, sand and gravel,** etc., as described in C. F. A. L. Tariff 197K, from Chicago, Ill., and points taking same rates to Miller, Ind., rate of 88c per net ton. Present—Rate, 76c per net ton.

21660. To cancel rate of $1.39 per ton on **sand and gravel** (all kinds), in effect from Columbus, O., to Charleston, W. Va., published in Hocking Valley Railway Freight Tariff I. C. C. No. 1939, permitting classification basis to apply.

21662. To establish on **fluxing (furnace or foundry), limestone,** carloads, following rates:

(a) 42c per ton of 2240 lb., from Hillsville and Walford, Penn., to Hubbard, O., Farrell, Penn., New Castle, Penn., Sharon, Penn., Sharpsville, Penn., West Middlesex, Penn., and Wheatland, Penn.

(b) 28c per ton of 2240 lb., from Hillsville, Penn., to Bentley (Mahoning county), O.

Present rates—(a) 55c per ton of 2240 lb.; (b) 36c per ton of 2240 lb.

21663. To establish on **sand and gravel,** carloads, from Troy, O., to various destinations, rates as shown in Exhibit "B." Present and proposed rates, shown in Exhibit "B."

EXHIBIT "B"

B. & O. R. R. Chicago Division— To	Proposed rate	Present rate
Hicksville, O.	125	140
Rosedale, O.	125	140
Mark Center, O.	115	120
Sherwood, O.	115	120
Defiance, O.	115	120
Standley, O.	105	120
Holgate, O.	105	110
Hamler, O.	105	110
Hoytville, O.	105	110
North Baltimore, O.	105	110
Galatea, O.	105	110
Bairdstown, O.	105	120
Bloomdale, O.	105	120
Fostoria, O.	115	120
Toledo Division—		
Farnhams, O.	100	110
Custar, O.	105	110
Milton, O.	105	110
Weston, O.	105	110
Tontogany, O.	105	120
Haskins, O.	115	120
Hull Prairie, O.	115	120
Roachton, O.	115	120
Perrysburg, O.	115	120
Bowling Green Branch—		
Bowling Green, O.	105	120
Portage, O.	105	120
Rudolph, O.	105	120
Bays, O.	105	120
Penna. R. R.—		
Ada, O.	(1) 95	......
Covington, O.	(2) 70	......
Bradford, O.	(2) 70	......
Northern Ohio Ry.—		
Delphos, O.	(3) 95	......
N. Y. C. R. R.—		
St. Marys, O.	(4) 85	......
Lakeview, O.	(6) 85	......
Erie R. R.—		
Spencerville, O.	(5) 90	......
N. Y. C. & St. L. R. R.—		
Arcadia, O.	(7) 105	......
Mortimer, O.	(8) 105	......

Routes

(1) B. & O. R. R., Lima, O., P. R. R.
(2) B. & O. R. R., Piqua, O., P. R. R.
(3) B. & O. R. R., Columbus Grove, O., N. O. Ry.
(4) B. & O. R. R., Wapakoneta, O., N. Y. C. R. R.
(5) B. & O. R. R., Lima, O., Erie R. R.
(6) B. & O. R. R., Wapakoneta, O., N. Y. C. R. R.
(7) B. & O. R. R., Leipsic Junction, O., N. Y. C. & St. L.
(8) B. & O. R. R., Lima, O., N. Y. C. & St. L.

21664. To establish on **sand and gravel**, carloads, Vincennes, Ind., to Princeton, Ind., commodity rate of 65c per ton of 2000 lb. Present rate—70c per ton of 2000 lb.

21674. To establish on **sand and gravel**, carloads, Simonson, O., to Cincinnati, O., rate of 40c per net ton. Present rate—Sixth class.

21679. To establish on **crushed stone and crushed stone screenings**, in bulk, in open cars, carloads, Centerville, O., to Harrison, Ind.-Ohio, 100c per net ton. Present—300c per net ton, sixth class.

21680. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica) and **gravel**, carloads, Bemus Point, N. Y., to State Line, N. Y., 70c per net ton. Present—Classification basis.

21681. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel**, carloads, North East, Penn., to Conneaut and Conneaut Harbor, O., 90c per net ton. Present—80c per net ton.

21682. To establish on **crushed stone and stone screenings**, in bulk, in open cars, carloads, from Kenneth, Ind., 101c to Notre Dame and Webster, Ind., and 102c per net ton to Bertrand, Mich. Present—113c per net ton.

21684. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica), carloads, Hugo, O., to Wickliffe, Willoughby, Mentor and Painesville, O., 75c per net ton. Present —80c to Wickliffe, 85c to Willoughby and 90c per net ton to Mentor and Painesville, O.

21694. To establish on **crushed stone**, carloads, to Detroit, Mich.:

From	Present	Proposed
Gibsonburg, O.	85	80
Holland, O.	85	90
Luckey, O.	85	90
Maple Grove, O.	85	90
Martin, O.	85	90
Silica, O.	85	90
Whitehouse, O.	85	90
Woodville, O.	85	90
Findlay, O.	95	100
Marblehead, O.	95	100
Sandusky, O.	95	100
Waterville, O.	95	95
Carey, O.	95	105
McVittys, O.	95	110
North Baltimore, O.	107	100
Ransoms, O.	95	105

21696. To establish on **crushed stone**, carloads:

To	From Genoa, O. Pro.	Genoa, O. Pres.	Martin, O. Pro.	Martin, O. Pres.
Lorain, O.:				
Via N. Y. C. & St. L.	80	90	80	90
Via N. Y. C.	80	90	80	80
South Lorain, O.:				
Via N. Y. C. & St. L.	80	90	80	90
Via N. Y. C.	80	90	80	80
Rocky River, O.:				
Via N. Y. C. & St. L.	80	90	80	90

21697. To establish on **crushed stone**, carloads, from West Columbus, O.:

To	Proposed	Present
Carpenter, O.	100	110
Rutland, O.	100	110
Middleport, O.	100	110
Pomeroy, O.	100	110
Gallipolis, O.	100	110

TRUNK LINE ASSOCIATION DOCKET

20879. **Limestone screenings**, carloads (See Note 2), from Atlas and Hamburg, N. J., to Kenilworth, Unionbury, Newark Heights, Springfield, Baltusrol and Summit, N. J., 170c per net ton. Present rate, 200c per net ton. Reason—Proposed rate is same as rate now in force from Lime Crest, N. J., to same points.

20893. **Stone, natural, crushed**, carloads (See Note 2), from Mill Hall, Penn.

(Rates in cents per net ton)

To—	Proposed	Present
Sykes, Penn.	$1.40	$1.75
Stanley, Penn.	1.40	1.60
DuBois, Penn.	1.40	1.60
C. & M. Jct., Penn.	1.40	1.60
Luthersburg, Penn.	1.40	1.60
Rockton, Penn.	1.40	1.60
Anderson, Penn.	1.40	1.60
Glendale, Penn.	1.40	1.60
Korb Siding, Penn.	1.40	1.60
Sharon Clay Siding, Penn.	1.40	1.60
Bloom, Penn.	1.40	1.60
B. & W. Jct., Penn.	1.40	1.60
Curwensville, Penn.	1.40	1.60
Ferncliff, Penn.	1.40	1.60
Hyde, Penn.	1.40	1.60

Reason—Rates to Sykes and DuBois are based on scale as per P. S. C. of Penn. Dockets 7530 and 7553. Proposed rates to the remainder of the points are necessary in order to avoid Fourth Section departures.

20894. **Limestone, unburnt, ground or pulverized, carloads**, minimum weight 50,000 lb., from Cavetown, Pinesburg group, subject to Group B of W. Md. Ry. I. C. C. 7770 and Thomasville-Bittinger group, subject to Group A of W. Md. Ry. I. C. C. 7770, to stations Mine No. 28 and Mine No. 38, W. Va., 12c per 100 lb. (present rate 16c per 100 lb.). Reason—Proposed rates are fairly comparable with rates to Davis, W. Va.

20897. **Crushed stone**, carloads (See Note 2), from Ringwood, N. J., to Rochelle Park, N. J., 80c per net ton (present rate 92c per net ton). Reason—Proposed rates are fairly comparable with rates on like commodities from and to points in the same general territory.

20910. **Stone, natural, crushed**, in carloads (See Note 2), from South Bethlehem, N. Y., to Chatham and Chatham Center, N. Y., 110c per net ton (present rate 120c per net ton). Reason—Proposed rates compare favorably with rates on crushed stone, from So. Bethlehem to Niverville, N. Y., and from So. Amsterdam to Delanson and Howes Cave, N. Y.

20911. **Stone, natural, crushed**, carloads (See Note 2), from Watertown, N. Y., to Glenfield, N. Y. (will apply only on traffic destined to points on the Glenfield and Western R. R.), 75c per net ton, rate to expire, December 31, 1929, unless sooner changed, canceled or extended. Reason—To meet motor truck competition.

20916. **Stone, chips or granules**, carloads, minimum weight 40,000 lb., from Texas and to Cockeysville, Md.

To	Proposed rate
Hanover, Penn.	125
Columbia, Penn.	125
Lemoyne, Penn.	140
Bareville, Penn.	140
Wilmington, Del.	150
Pomeroy, Penn.	150
Downingtown, Penn.	160
Northumberland, Penn.	180
Dresher, Penn.	180
Woodbury, N. J.	210
Trenton, N. J.	205
Reading, Penn.	210
Fisher, N. J.	210
Selbyville, Del.	210
Hazleton, Penn.	220
Millville, N. J.	225
Berwick, Penn.	230
Pleasantville, N. J.	240
Jersey City, N. J.	225
Harrison, N. J.	225
Wildwood, N. J.	280
Wilkinsburg, Penn.	320
McKeesport, Penn.	320
Buffalo, N. Y.	320
Lackawanna, N. Y.	320
Williamstown, Jct., N. J.	275

Proposed rates in cents per 2000 lb.

Reason—The proposed rates are fairly comparable with rates to Washington, D. C., Lancaster, Penn., Bridgeton, N. J., and various.

20791. **Limestone, crude, fluxing, foundry and furnace**, when shipped in open-top equipment, carloads (See Note 2), from Engle, Kearneysville and Martinsburg, W. Va., to Franklin, Penn., $1.96 per net ton.

20930. To amend Item 5513 of Agent Curlett's Tariff I. C. C. A239 covering **molding sand**, carloads, from Carrollton, N. Y., Irvine Mills, N. Y., and Killbuck, N. Y., to stations on the Erie R. R. west, by attaching a reference mark to Group B rates, as follows:

To Erie R. R.	Col. A	Col. B
Red House to Randolph, N. Y.	$1.35	x$1.35
Kennedy to Falconer, N. Y.	1.35	* 1.35
Jamestown, N. Y.	......	* 1.35
Lakewood, N. Y., to Corry, Penn.	1.39	† 1.39
Concord, Penn., to Sagertown, Penn.	1.80	1.80
Meadville, Penn.	1.80	‡ ......

Rates in cents per net ton.

Column A is Hutchins, Penn.—No change proposed.

Column B is all points on Bradford division. Change proposed only as shown in reference marks.

xFrom Carrollton, Irvine Mills and Killbuck, N. Y., 83c.

*From Carrollton, Irvine Mills and Killbuck, N. Y., 91c.

†From Carrollton, Irvine Mills and Killbuck, N. Y., $1.25.

‡From Carrollton, Irvine Mills and Killbuck, N. Y., $1.40.

Reason—To eliminate fourth section departures.

20936. **Sand** (other than blast, engine, foundry, glass, molding or silica) **and gravel**, carloads (See Note 2), from Baltimore, Md., to Singerly, Md., $1 per net ton (present rate $1.25 per net ton). Reason—Proposed rates are fairly comparable with rates now in force from Baltimore, Md., and Georgetown, D. C., to Frederick, Md.

20955. **Crushed stone**, carloads (See Note 2), from Frederick, Md., to Baltimore, Md., 90c per net ton. Present rate, 95c per net ton. Reason—Proposed rate is comparable with rate in force from York, Penn.

20451. **Crushed stone**, carloads (See Note 2), from White Haven, Penn., to **Tamaqua, Penn.**, $1.05 per net ton.

20894. **Limestone, unburnt, ground or pulverized**, carloads, minimum weight 50,000 lb., from B. & O. R. R. Frederick, Security, Bakerton, Martinsburg, Winchester, Strasburg districts, to stations, **Mine No. 28 and Mine No. 38, W. Va.**, 12c per 100 lb.

20970. **Stone, natural, crushed**, carloads (See Note 2), from Auburn, N. Y., to Tompkins and Nelson, Penn., $1.30 per net ton (present rate $1.50 per net ton). Reason—Proposed rates are fairly comparable with rates to Albion, Knowlesville, N. Y., and Lawrenceville, Penn.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

20864. **Sand**, other than blast, engine, foundry, molding, glass, silica, quartz or silex, and/or **gravel**, carloads (See Note 2), from Carpenterville, N. J., to Bound Brook, N. J., 95c per net ton (present rate $1.15 per net ton). Reason—Proposed rate is comparable with rate from Springtown, South Lakewood, N. J., etc.

16939. **Crushed or broken stone**, viz.: Granite, trap rock, quartz or sandstone, including grout, rubble or chips (waste products of quarries), minimum weight 50 tons of 2000 lb., from Greenfield, Mass., to Erving, Mass. Present, 70c; proposed, 65c. Reason—To meet motor truck competition.

16944. **Common building sand and run of bank or screened or crushed gravel**, minimum weight 50 tons of 2000 lb., from Westboro, N. H., to Woodstock, Vt. Present, 15c; proposed, $1.05 per net ton.

16949. **Common sand and gravel**, minimum weight 50 tons of 2000 lb., from Manchester, N. H., to Reeds Ferry, N. H. Present—Sand, 60c per net ton; gravel, 70c per net ton. Proposed—50c per net ton. Reason—To meet motor truck competition.

16970. **Sand** (See Note 2), from Davisville and Wickford Junction, R. I., to Paterson, N. J. Present, 28½c; proposed, 18½c. Reason—To provide same rate to Paterson as is now in effect to Newark, N. J., etc.

16993. **Stone, broken or crushed, in bulk**, in open cars (See Note 2), from Cook's (Plainville), Conn., to New Hartford, Conn. Present rate, 85c per net ton; proposed, 70c per net ton. **To expire November 30, 1929, unless sooner canceled, changed or extended.**

Sand and Gravel Rates to Southern Illinois and Iowa

THE FACT THAT for something like a year Examiner Fuller has been piloting a series of conferences and committee meetings designed to work out a compromise adjustment of rates on sand, gravel, and crushed stone to destinations in southern Illinois apparently has not made him cynical with respect to the so-called co-operative method of settling rate disputes. At the conclusion of the hearing in docket 21755 and Sub. 1, McGrath Sand and Gravel Co. against the A. T. & S. F. and others, at Chicago, before him, he said that, in his proposed report, he would suggest that the adjustment to the territory involved be the subject of co-operative handling and that a committee of three representatives of Illinois shippers, three Iowa shippers, and three railroad representatives be appointed for that purpose. Exceptions to the proposed report would be received, he said, so that the various issues might be as clearly outlined as possible in advance of the possible compromise effort.

The title complaint attacks the rates on sand, gravel, and crushed stone from Chillicothe, Ill., to destinations on the Burlington in southeastern Iowa. The subnumber, brought by the Moline Consumers' Co., and various interveners, bring into issue rates from Aurora, Sheridan, Moline, Joliet, Oswego and other Illinois points to the same destination territory. The complaints charge that the existing rates are unreasonable, that they exceed the aggregate of intermediates in violation of section 4 of the interstate commerce act, that the adjustment is unjustly preferential of Iowa producers at such points as Buffalo, Linwood, Muscatine and others, and that the Iowa intrastate rates and so-called Iowa interstate rates are unduly prejudicial of interstate traffic.

An explanation of special interest at this time in the rates seemed, for a time, to be offered by the statement of a complainant witness that a 100-million-dollar bond issue for road construction had been voted in Iowa. That was somewhat confused the last day of the hearing, however, when Harry Bellamy of Waterloo, Iowa, said that the supreme court of the state had declared the action unconstitutional, and that new construction in the Iowa territory, involved in the near future, would amount to little, compared to the representations of complainants.

W. E. Coyne, representing the McGrath company, said the rates to the destination territory from Chillicothe ranged from $2 to $2.30 a ton. T. E. McGrath, president of that company, testified that the commodities would not move at a rate in excess of $1.50. Mr. Coyne proposed a scale with that as a maximum, for the distances involved. It started at 60 cents for the first 20 miles, progressed 10 cents for each 20 miles up to 100 miles, and 10 cents for each 30 miles beyond that. He asked that it be applied for both single and joint line hauls, but suggested that, if the Commission thought an arbitrary should be added for joint line hauls, the scale start at 50 cents for 20 miles, with a 15-cent arbitrary up to 130 miles and 10 cents beyond.

In addition to the alleged breaches of transportation law enumerated, the complaint of the Consumers' company holds that the existing rates do not conform to the mandate contained in the Hoch-Smith resolution relative to allowing free movement of traffic. It further recites that there is a depression in the industry in Illinois and need of immediate relief. L. E. Moore, representing that company, proposed that the rates for single line hauls be made approximately 87% of the southeastern sand and gravel scale prescribed by the Commission in docket 17517. That would approximate the scale proposed by Mr. Coyne, according to him. He suggested a 20-cent differential for joint line hauls, and, further, that the entire adjustment to the territory should be revised, even though the Commission had set the rates from some origins which ship into it.

Leo Behrle, representing the Chicago Gravel Co. and the Illinois Sand and Gravel Co., with pits at Joliet and Oswego, Ill., objected to the strict application of a mileage scale as proposed by the previous witnesses. At the same time, he contended that "the trouble with Joliet is that it is in the wrong group." The Chicago group, in which it was located, he explained, extended as far north as Green Bay, Wis. He asked that Joliet be grouped with the producing points west of it.

The carrier testimony was presented by G. A. Hoffelder and Henry Christianson, of the Burlington. They defended the 7177 scale, which applies at present alternatively with the group adjustment on single line hauls, and generally attempted to show that the rates under attack were not in excess of reasonable maximum rates. The Iowa intrastate and interstate scales were characterized by Mr. Christianson as the "lowest I have been able to find anywhere in the country."

Representatives of Iowa producers called attention to the fact complainant witnesses had testified that the Illinois pits ran about 80% gravel and 20% sand. The situation was reversed as to the Iowa pits, it was said. In the light of that, George M. Cummins, traffic commissioner, Davenport Chamber of Commerce, said that the Illinois producers were attempting to get rates which would enable them to dump a surplus of gravel or coarse aggregate in Iowa. He held that a normal market would not consume an output in the relation represented by the Illinois production. There was said to be an overproduction of the commodities in Iowa and that higher production costs there called for consideration.

Ohio Flux Stone Rates Reduced

OHIO flux stone producers are benefited by the recent ruling of the state utilities commission reducing freight rates on flux stone from western Ohio to the Mahoning valley. The cut ranges from 11 to 21 cents per gross ton and affects railroads hauling such stone to Youngstown, Canton, Massillon, Warren, Cleveland and Steubenville. Present rates on flux stone range from 80 cents to $1.18 a gross ton.

The rate under the new ruling, which went into effect May 15, will give the Mahoning valley a charge of $1.05 from western quarries, which include Marblehead, Gibsonburg and Woodville.

Under the same rate, the cost to Canton and Massillon is 92 cents a ton. From Painesville and Fairport harbor the rate to Youngstown is 80 cents a gross ton, while to Canton and Massillon it is 90 cents a ton. —*Cleveland* (Ohio) *Plain Dealer.*

Reduced Rates on Glass Sand to Terre Haute

THE traffic department of the Terre Haute, Ind., Chamber of Commerce has announced that the Interstate Commerce Commission has just issued a decision ordering new rates to be established July 10 on all sand shipped into Terre Haute. Ottawa sand is now costing the local glass companies $2.14 per ton. Under the new rate crude sand will be hauled for $1.60 and washed sand for $1.90 per ton.—*Terre Haute* (Ind.) *Post.*

Silica Sand Scales

NEW silica sand rates are to be established, not later than July 10, from the Ottawa, Ill., district to destinations in Indiana, Ohio and Michigan, in accordance with scales, single and joint-line, applicable on crude and washed or processed sand. The Commission, by division 1, in a report writen by Commissioner Taylor, in No. 17822, River Raisin Paper Co. vs. Burlington et al., has found the existing rates unreasonable. This report also covers No. 16250, Indiana State Chamber of Commerce vs. B. & O. et al.; No. 16296, Terre Haute Chamber of Commerce vs. B. & O., Chicago Terminal et al.; and No. 17060, Frohman Chemical Co. vs. B. & O. et al.

In the last named case the Commission, by division 2, in 115 I. C. C. 322, found that the record failed to establish that the rate of $3.15, from Ottawa, Wedron and Utica, Ill., points in the Ottawa district, to Sandusky, Ohio, was unjust or unreasonable and dismissed the complaint. The case was reopened on petition of the complaint for reconsideration. After that case was dismissed the Commission, in No. 17272, Procter & Gamble vs. B. & O., and in No. 17817, sub. No. 1, Illinois Silica Sand Traffic Bureau vs. Santa Fe et al., ordered rates that

threw its original decision in the Frohman case out of line. Therefore in this case the prior decision was reversed. In the Illinois Silica Sand Traffic Bureau case, the Commission prescribed distance scales on sand from the Ottawa district to destinations in Indiana, Michigan and Wisconsin, for distances from 81 to 390 miles. In this case the Commission has found that the rates complained of were and are unreasonable to the extent they exceeded, exceed or may exceed the rates prescribed in that case, shown in both the report and the order in this case. Reparation was denied.

I. C. C. Decisions

20039. Intrastate Scale on Agricultural Limestone from Gibsonburg, O., to destinations in the lower peninsula of Michigan is used as a measure for nonprejudicial interstate rates in this case. The commission, by division 3, has found rates on this commodity between points mentioned, which were reduced on August 26, 1926, unreasonable prior to that date, but not after, to the extent they exceeded the rates established on and maintained since that day and awarded reparation.

Further finding is that the rates on like traffic which were not reduced August 26, 1926, were, are and for the future will be unreasonable; further that the maintenance of intrastate rates on this traffic from Michigan producing points to destinations in the lower peninsula south of the line of the Michigan Central between Detroit and Chicago, which are lower than the rates from Gibsonburg to the same destinations, will be unduly prejudicial to the complainant and unduly preferential of its competitors in Michigan.

Rates for interstate hauls that do not meet the Michigan intrastate scale standard were revised to that basis on or about May 25, the rates being stated in money terms on net tons, with appropriate arbitraries for joint line hauls.

The complaint was brought on account of the competition between the plant at Gibsonburg, a few miles south of Toledo, O., and the plants in Michigan, Sibley and Monroe, short distances north of Toledo.

15833-17817. Silica Sand Scale rate adjustment from the Ottawa, Ill., district to destinations in Indiana, Wisconsin and Michigan the commission, by division 1, has presented a distance scale to be used in making rates effective not later than May 16. These cases were heard jointly by the federal body and the Illinois Commerce Commission.

Commissioner Taylor, writing the report, limits the application of the order to destinations in Indiana, to destinations in Wisconsin on and south of the line of the C. M. & St. P. Ry. through Portage and Madison to Prairie du Chien and destinations in Michigan within 390 miles of Ottawa, Utica, Wedron, Oregon, Millington and Sheridan, Ill., the points of origin involved. The order says that reasonable grouping may be employed on condition that the rates from and to each group and in the aggregate average substantially the same as if made separately under the scale, and provided further that the rates shall not exceed the aggregates of the intermediates.

The commission found that the interstate rates on the sand of the sort indicated, from the Ottawa district to points in the Chicago, Ill., switching district and Chicago rate points, including Gary, Ind., are not unreasonable or unduly prejudicial. Rates to other destinations, however, to points in Indiana, Michigan and Wisconsin have been found unreasonable for the future but not unduly prejudicial.

The scale to be used in establishing rates in accordance with the finding in the title complaint follows:

Distance	Washed or Processed Silica Sand Single-line*	Washed or Processed Silica Sand Joint-line*	Crude Silica Sand Single-line*	Crude Silica Sand Joint-line*
20 miles and under........	72	96	60	80
40 miles and over 20....	84	108	70	90
60 miles and over 40....	100	120	80	100
80 miles and over 60....	108	132	90	110
100 miles and over 80....	120	144	100	120
125 miles and over 100....	132	156	110	130
150 miles and over 125....	144	168	120	140
175 miles and over 150....	156	180	130	150
200 miles and over 175....	168	192	140	160
225 miles and over 200....	180	204	150	170
250 miles and over 225....	192	216	160	180
275 miles and over 250....	204	228	170	190
300 miles and over 275....	216	240	180	200
330 miles and over 300....	228	252	190	210
360 miles and over 330....	240	264	200	220
390 miles and over 360....	252	276	210	230

*Cents.

15117, 15138, 20303. Cement Rates in Kansas City District. Truck transportation of cement in the Kansas City area and the possibilities of increase is one of the reasons for the commission's recession from part of its stand on the rates on cement in this territory. On further argument and consideration the commission has come to the conclusion that an intrastate rate of 4.5 c. from Cement City, Bonner Springs and Sunflower Kan., to Kansas City, Kan., is not unjustly discriminatory against interstate commerce. It has therefore reversed the part of the finding of division 1, in Nos. 15117 and 15138, 122 I. C. C. 337, to that effect. The unjust discrimination was to have been removed by the use of a rate of 6.5 c. as a substitute.

In addition to finding that the 4.5 c. rate did not unjustly discriminate against interstate traffic, the commission, in this report, found that it did cause undue prejudice to the gas belt traffic or undue preference to the traffic from Cement City, Bonner Springs and Sunflower, Kan.

17661-18892. Defining Magnesite Stucco. The commission upon reconsideration of the title case, 120 I. C. C. 590, and of 18,892 found the rates on stucco applicable to magnesite stucco, consisting of a mechanical mixture of ground calcined magnesite and fillers, but that such rates were not applicable to mixed carloads of magnesite stucco and magnesium chloride or to mixed carloads of magnesite stucco, magnesium chloride and crushed rock.

16170. Lime, groups authorized, in a second supplemental report, the carriers to group upper Mississippi river crossings and points around Chicago in the Chicago switching district, in connection with rates on lime, from Woodville, Ohio, and other points of origin covered in the case and 112 I.C.C. 7. The commission found that the application of the distance scale previously prescribed should be subject to the maintenance of group rates in the above territory, if the defendants desire to use such groups, based on the average distance from Gibsonburg, Ohio, and other base points to the destination included in each group. The outstanding order was modified accordingly.

21139. Sand-lime brick according to the decision of the commission, by division 3, is entitled to the rates applicable on common brick as defined in 68 I.C.C. 213, and 80 I.C.C. 179. The present rates on shipments from Mishawaka, Ind., to Benton Harbor, Buchanan, Cassopolis, Kalamazoo, Niles and St. Joseph, Mich., were found unreasonable and unduly prejudicial to the extent they exceed the contemporaneous rates on common brick.

Rates on that basis were made effective on April 25.

17000. Sand and Gravel. For two days, April 3 and 4, attorneys for the railroads, for sand and gravel producers, commercial organizations, municipalities and state highway departments argued, to the whole commission, about the level of rates in the southwest on sand, gravel and other road-making materials classed with sand and gravel, in No. 17000, part II, Hoch-Smith sand and gravel, No. 9702, the Memphis-Southwestern Investigation, No. 16002, R. A. Gibson vs. Kansas City Southern et al., and No. 18702, Tennessee-Arkansas Gravel Co. vs. Missouri Pacific et al.

The subject has been treated co-operatively by the federal and a number of state commissions. For that reason state commission representatives sat with the federal commissioners while the discussion was taking place.

As a general proposition the railroads contended that the rates proposed by the commission's examiner were not high enough and that a very large part of the trouble about the rates was caused by what they called the extremely low level of the so-called good roads' scale in Louisiana. The rates prescribed in the Memphis-Southwestern investigation, it was generally admitted, were not satisfactorily graded. The Louisiana rates were described as being so low that one had to reach for them in a well. Shippers and the governmental bodies suggested lower levels of rates than on articles used in manufacture on account of their use in public improvements, on which the railroads said they paid their fair share of taxes, as presumably all citizens did.

Marquette Cement Making Extensive Improvements at Cape Girardeau

R. B. DICKINSON, vice-president of the Marquette Cement Manufacturing Co., and R. Moyle, Sr., general superintendent of the company, were in Cape Girardeau, Mo., recently consulting with engineers of the Burrell Engineering and Construction Co. of Chicago, regarding the construction program to be launched soon at the Marquette plant in South Cape Girardeau.

A few more weeks will be required to work out the plans, according to Vice-President Dickinson, after which bids will be received and the contract awarded. The project, the cost of which is now being withheld by the Marquette company until final plans have been drafted and the nature of the program definitely outlined is said to run in a large figure.

Actual construction will begin about July 1, and the cement barge line between Cape Girardeau and St. Louis and Memphis, Tenn., probably will be put in use early in the fall, Mr. Dickinson said. The remainder of the year will be required to complete the program once it has begun, Mr. Dickinson said, and an effort will be made to get the new addition of the plant in operation by the first of the coming year. The construction program will call for erection of buildings and installation of machinery which will double the present capacity of the plant. Vice-president Dickinson said that the company will be ready to announce in a few weeks the exact plans for construction work and the cost of the project.—*Cape Girardeau* (Mo.) *Missourian.*

Installing Additional Equipment at Hi-Rock Plant

THE Hi-Rock Products Co., Evansville, Ind., is equipping its plant at Marengo, Ind., to produce 500 tons of pulverized limestone a day, according to an announcement. Required machinery has been installed for crushing and fine reduction as well as vibrating screens. The plant is being equipped to furnish crushed stone for roads and other construction work, and rock screenings for use in the construction of walks. The company is reported to have orders on hand for 50,000 tons of these products.

Chillicothe (Ill.) District Gravel Shipments Near Capacity

OVER 200 cars of gravel per day is the rate at which the three gravel pits are sending their product out from Chillicothe at the present time, according to reports of the two railroads which handle their shipments.

The Rock Island railroad reports approximately 100 cars per day from the Coogan plant, the Peoria Builders Supply Co. which are on their line and the McGrath Sand and Gravel Co. plant which is on the Santa Fe. The McGrath company ships in addition to this a large quantity which goes out over the Santa Fe.

Much of the gravel which goes out from the three local plants is used in the construction of hard roads and is sent to various points. Practically all of the gravel and sand used in Peoria comes from Chillicothe, while much of it goes into Chicago where it is used in the construction of pavement, concrete buildings, sidewalks, curbing, foundations and other work. Still other shipments go to Iowa and other states.—*Chillicothe* (Ill.) *Enquirer.*

A. S. T. M. Symposium on Mineral Aggregates

THE American Society for Testing Materials announces as a portion of the program of the annual meeting to be held at Atlantic City, June 25-28, a "Symposium on Mineral Aggregates."

Papers of particular interest to producers and users are: "Methods of Inspection" by A. S. Rea, chief, bureau of tests, Ohio state highway department; "Fine Aggregates in Concrete," by H. F. Gonnerman, of the Portland Cement Association; "Fine Aggregates in Bituminous Mixtures," by H. W. Skidmore, Chicago Paving Laboratory; "Influence of Coarse Aggregates Upon the Strength of Concrete," by F. C. Lang, engineer of tests and inspections, Minnesota state highway department; "Influence of Coarse Aggregate Upon the Durability of Concrete," by F. R. McMillan, of the Portland Cement Association; "Effect of Aggregates Upon the Stability of Bituminous Mixtures," by Prevost Hubbard, of the Asphalt Association and "Aggregates in Low Road Types," by C. N. Conner, of the American Road Builders' Association.

The symposium will be opened by a paper on "Organization Problems," by R. W. Crum, director of the Highway Research Board, and chairman of the committee in charge of the program, and will close with a paper on "Needed Research in Aggregates," by F. H. Jackson, chief of the bureau of tests, United States Bureau of Public Roads.

In addition to the above, there will be papers dealing with the "Use of Aggregates for Sanitary Filters and Railroad Ballast," by Dr. H. F. Kriege, of the France Stone Co.; "Influence of Quality of Aggregates on Fire Resistance of Concrete," by Dr. S. H. Ingberg, of the Bureau of Standards; "Fine Aggregates in Mortar and Plaster," by J. C. Pearson, of the Lehigh Portland Cement Co. as well as a paper by R. B. Young, of the Ontario Hydro-Electric Commission, on "Determination of the Concrete Making Value of Fine Aggregates from Water-Cement Ratio Tests."

Gypsum Patent Difficulties Reported Settled

A SERIES of patent litigations which have disturbed the gypsum industry for a number of years has been settled, according to an announcement made May 23 by the United States Gypsum Co. Licenses under the patents for the manufacture of various commodities have been granted important producers in the industry, it was also stated, although the company would not amplify its formal announcement nor give any details of the settlement. Amicable settlement of a vexatious patent situation, however, is expected to have important bearing on the industry. A disastrous competitive situation in the industry has been aggravated by a succession of patent disputes and disagreements with a consequence of constantly diminishing earning even for the strongest agencies in the field.—*Chicago* (Ill.) *Journal of Commerce.*

Cary Granite Starts Operations at Sparta, Georgia

A NEW GRANITE QUARRY has been opened at Sparta, Ga., by the Cary Granite Co., the operators. The plant is owned by C. S. Cary, well known local capitalist, and F. L. Stewart, for a number of years manager of the Georgia Quincy Granite Co. of Sparta. The company will make a specialty of crushed stone for paving purposes, street curbing and building stone.

The quarry is located on a portion of the J. O. Moore lands between this city and Culverton and is said to be one of the best veins of granite in this section. The owners of the quarry will put in modern machinery so that they may compete with the other granite quarries in the state.—*Macon* (Ga.) *Telegraph.*

Milwaukee's Municipal Quarry Production Costs

MILWAUKEE'S municipal stone quarry has in the last six years produced and delivered 202,332½ cu. yd. of crushed stone, at an average cost of $1.72 a cu. yd., or a total of $347,938.92. This statement is made by P. M. Johaning, mechanical engineer in the department of public works, in an article in a recent issue of the *American City.*

The cost figure does not include interest, depreciation, tax or overhead, says Mr. Johaning. The city pays the county a small royalty, the quarry being on land owned by the county, which takes care of part of the overhead, it is claimed. If all the unconsidered items are estimated and included, Mr. Johaning fixes the cost of the stone at $2.05 a cu. yd.

The various city departments are charged $2.25 a cu. yd. for the stone, this being an average market price, according to the report.

Allentown Safety Meeting of P. C. A. Has Largest Attendance Recorded

Employes of Lehigh Valley Mills More Enthusiastic Than Ever

ON MAY 23 the annual regional safety meeting for the Lehigh Valley cement mills was held at the American hotel with the largest attendance yet recorded and a noticeable increase in interest and enthusiasm. Every mill represented in the membership of the Portland Cement Association in the Lehigh Valley sent its delegation and the total registration for the meeting reached 302.

The local committee on arrangements consisted of David Adam, safety engineer, Lawrence Portland Cement Co., chairman; R. B. Fortuin, assistant to the general manager, Pennsylvania-Dixie Cement Corp.; Fred Hunt, safety engineer, Nazareth Cement Co.; O. D. Havard, superintendent, Giant Portland Cement Co. and S. Henry Harrison, assistant superintendent, Vulcanite Portland Cement Co.

Program

Afternoon Session—2 p.m.

Chairman—R. B. Fortuin, assistant to general manager—Pennsylvania-Dixie Cement Corp.

"A few words from headquarters," and discussion; A. J. R. Curtis, assistant to general manager, Portland Cement Association.

Introduction of delegates—1928 trophy winners; "Safety work in Pennsylvania cement mills," followed by "The quarry industry of Pennsylvania"—a motion picture—Thos. Quigley, chief of quarries, Commonwealth of Pennsylvania.

"My experience with the safety problem"; John Roach, deputy commissioner of labor, State of New Jersey.

"First-aid training in cement Mills"; R. D. Currie, safety engineer, U. S. Bureau of Mines.

Round Table Discussion:

(*A*) "Are we getting the most of the significant accident bulletin?"

(*B*) "Value of investigationg and analyzing the cause of accidents."

(*C*) "How can we reduce the fall accident peak?"

Annual safety dinner—6:30 p.m.

Chairman, D. Adam, Lawrence Portland Cement Co.

Toastmaster, Major H. A. Reninger, president, National Safety Council (Lehigh Portland Cement Co).

Presentation of official "June no-accident" flags to the Lehigh Valley Mills; A. J. R. Curtis.

"Some railroad ideas about safety"; C. H. Stein, assistant to president, Central Railroad of New Jersey.

Orchestra—Courtesy of Nazareth Portland Cement Co.

Safety songs—song leader, W. P. Gano, assistant general manager, Pennsylvania-Dixie Cement Corp.

One of the most interesting features of the meeting occurred early in the program, when the delegates from many of the trophy-winning mills were introduced. The short messages from each delegate carried to the meeting the realization that perfect safety records are possible in almost any cement mill or quarry, no matter where located, the nationalities of the workmen, the type of equipment or process employed or any of the other alibies so frequently heard as to why a given mill is unable to succeed.

Thomas J. Quigley, veteran head of the quarries section, department of industry and

R. B. Fortuin, chairman of the arrangement committee, Allentown safety meeting

labor of Pennsylvania, who undoubtedly has the most intimate acquaintance of any individual with quarry and mill safety work in his state, spoke in part as follows (after which he showed an excellent film on safety in the quarries of Pennsylvania):

"No other industry in this great commonwealth of Pennsylvania has been more active in accident prevention work than the cement manufacturers. The records made by your industry provide positive proof of what can be done to protect life and limb when men and management co-operate 100% for the elimination of accidents.

"The most serious problem confronting industrial managers today is the prevention of accident. A careful study of industrial statistics show us that 75% of all accidents are preventable. Your association has proven that through real safety work accidents can be reduced to a previously undreamed of minimum. You have been pioneers in the safety movement and the records made by you have encouraged others to follow in your footsteps.

"While the accident prevention campaign is only in its infancy, I am confident we are on the right road, and in a few years we will be able to point with pride to the remarkable reduction in industrial accidents in Pennsylvania, and no other industry in this commonwealth deserves greater credit for having spread the gospel of accident prevention than the cement manufacturers.

Need a Cement Tariff

"Your industry is suffering today from foreign competition, and congress seems more interested in the welfare of our European neighbors than our American people. The ways and means committee of congress is very much afraid to increase the tariff on cement to where it properly belongs lest they offend some of their beloved friends in France, Belgium, England and Germany. What we need in Washington is more congressmen with backbone, and fewer weak sisters who have wishbones in place of backbones. Our policy should be 'America for Americans — first — last — and all the time.' Many other industries are suffering also. We are indeed fortunate in having in Washington fighting night and day for the protection of our American industries, Joseph R. Grundy and Senator David Reed. If we had a few more Grundies and Reeds in Washington, we would have a real tariff and 100% protection for our American industries. That means real job safety for our men."

Round Table Discussion—Increasing Use of Technical Information

The round table discussion was concentrated as far as possible on the three subjects announced. Particular interest was indicated in making better use of the "Significant Accident Bulletin," the monthly list of accidents distributed by the Portland Cement Association. Discussion brought out that practically all mills make these bulletins freely accessible to the workmen by posting on bulletin boards, sending marked copies directly to foremen and workmen and

in many cases by requiring foremen to read and discuss with their men such accident reports as pertain to each department.

Several expressions indicated a need for more complete information than that now furnished by the bulletin. A plea was made to members to report their accidents more comprehensively than in the past and to the association to amplify the bulletin. The entire discussion on the subject was very helpful and indicated that the accident prevention work of the industry has grown more highly technical and now requires for its further progress very complete, accurate and detailed reports of all accidents appearing to have significance.

The second subject listed for discussion simply served to amplify the ideas presented with relation to preparing and distributing more accurate reports, emphasizing, however, that accident reports are no longer merely records in any of the mills, but have come to be looked upon as the technical data on which the prevention of future accidents largely depends. A variety of suggestions indicated the interest of the mills in reducing accidents which have been occurring during the fall months of operation.

David Adam, dinner chairman

H. A. Reninger, toastmaster

Ovation to Major Reninger

After dinner, Chairman Adam presented Henry A. Reninger, president of the National Safety Council, as toastmaster. Major Reninger, who has been in charge of safety work for the Lehigh Portland Cement Co. for many years and was recently president of the Lehigh Valley Safety Council, received a hearty ovation from all sections of the crowded banquet room. A pleasant ceremony ensued when Major Reninger called upon A. J. R. Curtis to present each Lehigh Valley mill with its "June no-accident" flag, on behalf of the board of directors of the Portland Cement Association. A representative of each mill then came to the space before the speaker's table, where he pledged on behalf of his mill organization to keep the flag at the masthead of the mill pole throughout June and as long thereafter in the succeeding months, if possible.

The registration of the meeting was as follows:

Registration

Allentown Portland Cement Co.
Irvin F. Brensinger, Evansville, Penn.
N. O. Dries, Evansville, Penn.
Charles B. Focht, Evansville, Penn.
Clayton Kaufman, Evansville, Penn.
George M. Koller, Evansville, Penn.
E. C. Hawk, Allentown, Penn.
C. F. Doomer.

Alpha Portland Cement Co.
C. H. Denman, Bellevue, Mich.
A. F. Haase, Easton, Penn.
Matt P. Flynn, Easton, Penn.
W. H. Smith, Easton, Penn.
W. W. Hamilton, Ironton, Ohio.
Vernon C. Mack, Martin's Creek, Penn.
D. A. McVicker, Manheim, W. Va.
J. F. Magee, Easton, Penn.
S. Moser.
F. A. Roder.
Raymond Seas.
Frank Wambold.
T. L. White.
Jack Hot.
Arthur O. Kinds.
H. E. Leaker.

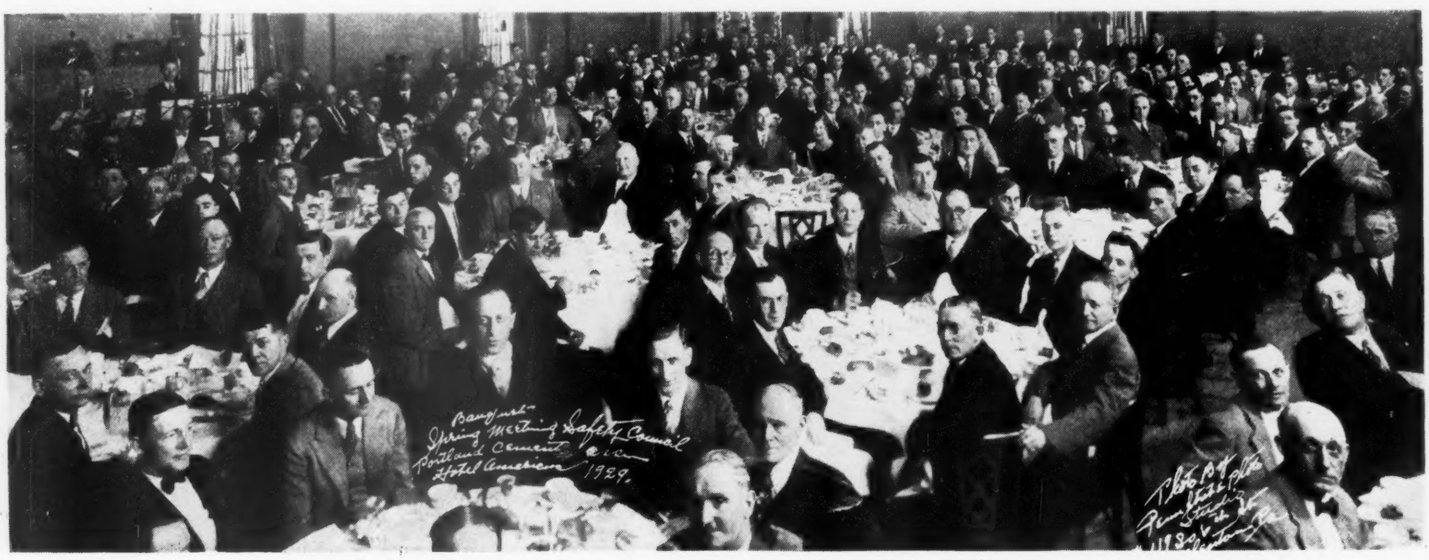
Atlas Portland Cement Co.
F. J. Boucher, Northampton, Penn.
W. E. Gehres.
M. A. Winsch.
N. G. Campbell.
A. Hamilton.
John Pavlicko.

Giant Portland Cement Co.
Stanley W. Lutz, Egypt, Penn.
H. S. Reppert, Egypt, Penn.
Julia A. Weder, Egypt, Penn.
J. L. Best.
John Bivar.
E. P. Blunk.
William Brandt.
Charles M. Clader.
Charles P. Dausser.
Joe Herceg.
A. G. Hower.
Ray Lazarus.
A. H. Leh.
Thomas G. Miller.
John Plelador.
Charles Rutman.
Jacob H. Smith.
H. W. Dreyer.
C. W. Acker.

Glens Falls Portland Cement Co.
E. H. Parry.

Hercules Cement Corp.
Willis Altronuis, Phillipsburg, N. J.
Warren Boyer, Nazareth, Penn.
A. H. Bruci.
Charles Clausen, Jr., Nazareth, Penn.
Ernest M. Ayres.
Elwood U. Bauman.
E. D. Berkaw.
Stanley W. Downs.
Bruce I. Doyle.
J. Victor Halberstadt.
John Jones.
J. A. Schaeffer.
Byron M. Schmidt.
Arthur Steiffert.

Lawrence Portland Cement Co.
Martin C. Leke, Fogelsville, Penn.
G. H. Moritz, Fogelsville, Penn.
M. S. Ackerman, New York, N. Y.
D. Adam, Northampton, Penn.
Thomas C. Knihus, Fogelsville, Penn.
Sherwood S. Kroffer, Fogelsville, Penn.
H. P. Haukes, Northampton, Penn.
William J. Muzney, Northampton, Penn.
George E. Young, Northampton, Penn.
Fred J. Andrews.
Michael Ballas.
H. G. Bonney.
Frank D. Dausser.
E. G. Fluck.
Clinton Gardner.
Herbert Gillespie.
Moses Gorsline.
Samuel P. Helfrich.
J. E. Shick.
Charles Kech.
William P. Kerikel.
Charles Kleckner.
Oscar Kruge.
Wilmer S. Lehr.
Gerge Leibensperger.
M. K. Liclity.
Sylvanus Miller.
Charles Newhard.
Charles J. Phifer.
R. D. Schaffer.



Delegates of the Lehigh Valley cement mills at the Allentown, Penn., banquet

Lawrence Simmons.
Amos H. Titus.
Henry D. Smith.

Lehigh Portland Cement Co.
Olen A. Griesemes, Allentown, Penn.
Sam Laub, Allentown, Penn.
Edward C. Spring, Allentown, Penn.
E. J. Fray, Bath, Penn.
Horan H. Heller, Jr., Bath, Penn.
H. H. Heller, Sr., Bath, Penn.
Roy H. Rohr, Bath, Penn.
Henry M. DuKinshud, Easton, Penn.
Herbert George, Egypt, Penn.
Amandes Glose, Fogelsville, Penn.
John T. Koch, Fogelsville, Penn.
Elmer W. Kuhas, Fogelsville, Penn.
Robert J. Laudenskoger, Fogelsville, Penn.
Andrew Furanpahitz, Fogelsville, Penn.
Fred S. Wendlins, Fogelsville, Penn.
Charles E. Kietzman, Iola, Kan.
James O. Myers, Iola, Kan.
C. A. Swiggett, Iola, Kan.
A. K. McFekamp, Bath, Penn.
David J. Ruch, Bath, Penn.
Benjamin F. Roth, Ormrod, Penn.
Elmer L. Schoemaker, Ormrod, Penn.
George Kaufman, Jr., Sandt's Eddy, Penn.
K. E. Menear, Sandt's Eddy, Penn.
C. P. Benner.
Benjamin P. Clauser.
L. E. Diehl.
Paul N. Drersbach.
Benjamin W. Elwin.
Y. Thomas Evans.
Reuben A. Fogel.
John F. Frickert.
George C. Fullajar.
C. S. Gausner.
Samuel F. Gebsinger, Jr.
Milton O. George.
Fred A. J. Haus.
Luther C. Kners.
Charles E. Keck.
Edwin Knappenberger.
Charles Newhard.
Martin Lehr.
Wilmer Lehr.
Sherwood Schaffer.
H. G. Bonny.
H. M. Dickenshuel.
J. A. Gish.
John J. Kratzes.
F. E. Laubach.
Fred Lobach.
Russell H. Marsh.
B. F. Meixsell.
Earl G. Moritz.
William J. Montz.
Roy A. Moritz.
Dennis O'Donnell.
Frederick Ogals.
Charles Rabers.
Henry A. Reninger.
Charles Rose.
Norman H. Sell.
Anson D. Sittler.
Lewis A. Stickel.
William C. Stufflet.
Edward Wagner.
Herman Wetherhold.

Lone Star Cement Co., Pennsylvania
Kryl Carlf, Nazareth, Penn.
Granvill Graves, Nazareth, Penn.
Arleyne E. Heims, Nazareth, Penn.
J. H. Heintzelman, Nazareth, Penn.
O. E. Kreamer, Nazareth, Penn.
Frank B. Leh, Nazareth, Penn.
Howard H. Leh, Nazareth, Penn.
Oliver Miller, Nazareth, Penn.
A. D. Schinkler, Nazareth, Penn.
E. P. Schuerr, Nazareth, Penn.
T. Haffner.
Milton S. Ludenmoyer.
Edw. M. Norris.
F. E. Searfass.
Sterling Smith.

Marquette Cement Manufacturing Co.
Raymond Ford, Cape Girardeau, Mo.
Manning P. Greer, Cape Girardeau, Mo.
H. C. Mason, Cape Girardeau, Mo.
Abraham George.

Nazareth Cement Co.
George E. Britt, Nazareth, Penn.
Jacob V. Danekes, Nazareth, Penn.
S. J. Feknel, Nazareth, Penn.
Abs. George, Nazareth, Penn.
Clarence E. Matthews, Nazareth, Penn.
Walter J. Randle, Nazareth, Penn.
H. A. Reichenback, Nazareth, Penn.
G. B. Searks.
Lawrence R. Rice, Nazareth, Penn.
Samuel S. Segmur, Nazareth, Penn.
G. B. Searless, Nazareth, Penn.
Albert A. Schiery, Nazareth, Penn.
Harold W. Starner, Nazareth, Penn.
William Stout, Nazareth, Penn.
R. G. Cowell.
Charles H. Fehr.
Robert Frantz.
Albert Fry.
Albert C. Garr.
William Gaston.
Jesse Hensen.
Clyde Hilliard.
George A. Hogenbuch.
Frederick B. Hunt.
F. C. Marcke.
J. P. Matthews.
Howard C. Mitchell.
Virgel L. Varnatta.

Oregon Portland Cement Co.
J. C. Haines.
H. R. Shipley.

Pennsylvania-Dixie Cement Corp.
Melville Cary.
William A. Houser, Bath, Penn.
Kyle Dishner, Kingsport, Tenn.
William Altemose, Nazareth, Penn.
H. C. Carpenter, Nazareth, Penn.
Peter Clarburi, Nazareth, Penn.
M. B. Eyer, Nazareth, Penn.
Charles Kenecht, Nazareth, Penn.
B. F. Kimminour, Nazareth, Penn.
Otto Kolbe.
John Lohn, Nazareth, Penn.
Clyde Malis.
E. C. McClanofan.
Fred Menning.
S. Refli.
Pirker Sandos, Nazareth, Penn.
Floyd J. Werner, Nazareth, Penn.
Alois Serir.
Kenneth Abel.
V. C. Beers.
Edwin Berger.
Robert J. Becker.
L. A. Britts.
Ross Carty.
Wilson Delong.
Franz Deutsch.
James K. Betherolp.
Oliver Forca.
R. B. Fortuin.
William Fry.
William P. Gano.
William Gano, Jr.
Joe Geider.
Morris D. Goodhard.
Steward F. Gary.
F. Guenther.
Leon I. Heyes.
John Houszer.
Henry G. Kramer.
William H. Mann.
Claud W. Metz.
Ray Miller.
Paul O. Moser.
Clifford Newhard.
Spencer M. Ryh.
Charles Roth.
Nelson D. Roth.
Charles J. Ruth.
George Schlegel.
Howard F. Schwenburger.
Oly F. Shook.
Victor A. Grubes.

Valley Forge Cement Co.
John Byrne, West Conshohocken, Penn.
Charles Cooper, West Conshohocken, Penn.
Herman Runert, West Conshohocken, Penn.
R. F. Weston.
D. C. Morgan.
N. S. Schmidt.
A. A. Tucker.

Vulcanite Portland Cement Co.
Floyd Brinker, Alpha, N. J.
James Mannicai, Alpha, N. J.
S. H. Harrison, Phillipsburg, N. J.
W. B. Simpson, Phillipsburg, N. J.
Kathryn W. Butler, Vulcanite, N. J.
J. H. Boyd.
George Barbadua.
Albert Bischoff.
John P. Bryan.
E. S. Dunn.
Leo Perniui.
Stanley Particke.
S. R. Pursel.

Wolverine Portland Cement Co.
J. Dieterman, Coldwater, Mich.
L. A. Hutchins, Coldwater, Mich.
B. L. Rice, Coldwater, Mich.

Portland Cement Association
A. J. R. Curtis, Chicago, Ill.

Bates Valve Bag Corp.
Joseph Hahn, Nazareth, Penn.
George W. Leopold.
W. W. Thomas.

Pennsylvania Manufacturers Casualty Insurance Co.
Dr. A. R. Zack.
S. F. Watts.

Department of Labor and Industry
Thomas J. Quigley, State of Pennsylvania.
Robert F. Ross, Harrisburg, Penn.
John Roach, State of New Jersey.

New Jersey Central
T. C. Mulligan.
C. H. Stein.

Miscellaneous
Carleton Cressman, reporter, *Chronicle and News.*
R. D. Currie, U. S. Bureau of Mines.
Lewis E. Everett, Orefield, Penn.
Clyde Malis.
George A. Heil, Orefield, Penn.

A Tribute to Russell Frame, Leader in Safety Work —P. C. A.

RUSSELL FRAME, late director of accident prevention and insurance, and paymaster of the Alpha Portland Cement Co., was for many years a member of the committee on accident prevention and insurance of the Portland Cement Association. He died march 8, 1929, at his home in Phillipsburg, N. J.

Mr. Frame was one of the most active leaders in the safety work of the cement industry, and served in many important capacities. For several years he was chairman of the Cement Section of the National Safety Council, and used his efforts in that position to coordinate the work of the Safety Council with the safety work of the Portland Cement Association, in order to make it of maximum benefit to the industry. To Mr. Frame the industry is indebted for many new ideas and advanced methods for successfully dealing with mill and quarry accidents. His counsel in these matters was often sought not only by the association, but by individual cement manufacturers and others. In all such cases Mr. Frame responded cheerfully and always with mature and valuable contributions.

Russell Frame

The progress made in industrial safety work of the country reflects his interest and help in many ways. The success of his own company in the winning of trophies for perfect records and in a very fine improvement throughout the entire organization may be credited very largely to the efforts of Russell Frame. The committee on accident prevention and insurance of the Portland Cement Association, the Cement Section of the National Safety Council and the officers and directors of the Lehigh Valley Safety Council have all formally expressed deep regrets at Mr. Frame's passing, with the feeling that in his death the cause of industrial safety has lost one of its most verile and able advocates, whose work has left a lasting impression in his own company and community, in the cement industry and in the industrial world at large.

Mr. Frame was a native of Phillipsburg and entered the employ of the Alpha Portland Cement Co. in 1901 on his graduation from high school. He was timekeeper at the early mills of the company at Alpha,

N. J., and later at Martin's Creek, Penn., plants, becoming paymaster in charge of time-keeping at all plants in 1910.

When the Alpha company organized its safety work in 1915, Mr. Frame became secretary of the central safety committee and under his leadership results in the way of a largely reduced number of accidents and sentiment for safety work among men and management grew until the Alpha company appeared among the leaders and won five Portland Cement Association trophies in two years.

Mr. Frame was well known and highly respected among the citizens of Easton and Phillipsburg and his hospitable home was open to all comers. He is survived by a widow, Mrs. Lulu H. Frame and two daughters, Mrs. George House and Miss Elda Frame.

Memorial Day Celebrated with Safety Round Up at Mildred

Consolidated Plant Unveils and Dedicates Its Trophy

UNVEILING and dedicating of the first of the Portland Cement Association safety trophies awarded for perfect safety record during 1928, took place at the Mildred (Kan.) plant of the Consolidated Cement Corp on Thursday afternoon, May 30.

The event was undoubtedly the largest popular celebration which has ever taken place in Mildred. Notwithstanding several heavy showers the last of which concluded just before the ceremonies started at 2:30 o'clock, a crowd estimated at nearly 2,000 persons had gathered in the parkways before the mill office.

Promptly at the hour set, the public school band of Maran, Kan., a well-trained musical organization of boys and girls opened the program with a spirited musical number. R. M. Johnson, district superintendent of the Consolidated Cement Corp. then made an address of welcome in which he traced the remarkable progress of cement mill safety work during the last few years. In conclusion he introduced A. J. R. Curtis of the Portland Cement Association who made the speech of presentation on behalf of the Portland Cement Association. Mr. Curtis said:

"This magnificent assemblage of happy people is quite different from the sober groups which in times past have gathered around the beloved victim of an acident.

"One of the real privileges of this generation is to witness the marvelous increase in the value placed on the human being, his welfare and his opportunities.

"Industry has awakened to the realization that one of its real purposes, as well as its first obligation, is to benefit and protect from harm those who enlist as willing workers.

"Mr. Johnson, you and your organization have accomplished a splendid achievement and have set a wonderful example in operating throughout 1928 without a single lost time accident.

"It is almost inconceivable that so large a group of men, constantly exposed to so great a variety of hazards, could continue uninterruptedly to avoid physical mishaps over an entire year. It means that every man has paid intelligent and painstaking attention to business.

"In addition to good team work it is evident that there has been an unusual measure of self-control, practiced by each individual.

"At a recent safety meeting some one compared a man to a Corliss engine. First of all the engine must be a good machine, but it would be useless without steam behind it and it would tear itself to pieces unless equipped with a good governor. How many a competent hardworking man has failed for the lack of self-control, the human governor? Only he who governs himself well is competent to govern others.

"I now take pleasure in extending the congratulations of the entire cement industry to your president, John L. Senior, your general superintendent, James E. Curtis, your district superintendent, R. M. Johnson, and to every employe of the plant and his family. Any amount of pride on your part is justified on this occasion.

"Let me congratulate, likewise, this thrifty community on the enterprise shown by this cement mill as one of your worthy and ambitious local industries. At this point it might be fair for me to condole with your local medical and surgical fraternity on the loss of cement mill business, did I not realize how sincerely and whole-heartedly they have assisted in this accident prevention work.

"Your representatives, Messrs. Harris and Walton, received the formal award of this trophy at New York on May 21. It is now my pleasant duty, acting by authority of the board of directors and on behalf of the members of the Portland Cement Association throughout America, to turn over to you, the Portland Cement Association safety trophy for 1928.

"It is recognized as the highest award obtainable in the cement industry. Very appropriate, it carries with it the highest honors our industry has to bestow.

"This trophy is a token of your leadership among cement mills and as such will long be held in high esteem by your organization and community. Still we must not forget that the real, tangible results of your efforts is this fine body of workers here today, complete in number, vigorous and unimpaired in physical faculties, hopeful, and able to enjoy the good things of life.

Portland Cement Association safety trophy awarded the Mildred, Kans., plant of the Consolidated Cement Corp. for a perfect safety record during 1928. The committee to inspect the trophy are, from left to right: J. H. Greene, purchasing agent; A. E. Hjerpe, assistant general sales manager; F. E. Dodge, chief engineer, and M. S. Shinnick, sales department

"You have learned that co-operation is the golden key to success. We trust it will continue during succeeding years to unlock to all connected with the Consolidated organization, the bounties of health and happiness."

Following the presentation of the trophy, it was unveiled by two members of the safety committee of the Mildred plant, as the band played "America." E. L. Drury, assistant superintendent, in charge at Mildred, accepted the trophy on behalf of the Mildred employes and served notice that the mill intended to win again in 1929.

John L. Senior, president, Consolidated Cement Corp.

President Senior's Message

Taking the place of President John L. Senior of the Consolidated Cement Corp. who was confined to his bed in Chicago with a severe illness, District Sales Director L. W. Rogers, bespoke Mr. Senior's intense interest in the safety work in the Consolidated mills and read the following letter from Mr. Senior:

"It is with much regret that I am unable to be with you today to celebrate the dedication of the safety trophy and take part in your Memorial Day services. To the members of the Mildred plant and to their families I want to extend my hearty congratulations and express my appreciation of your accomplishment.

"What you have done toward eliminating the unhappiness and misery that follow accidents is indicative of your intelligence and trustworthiness and it pleases me to know that my organization can conceive an ideal and bring it to full accomplishment.

"Your achievement will be an inspiration to others; it will show them the way and will prove what once seemed a probability is now a reality.

"Let this first victory be but a forerunner of many more to follow so that in the years to come your childen and your children's children may look upon this monument as a token marking the advent of a new day deprived of its horrors and fatalities."

Mr. Rogers then read the following telegrams received from Frank H. Smith of New York, president of the Portland Cement Association, and J. B. John, of Newaygo, Mich., chairman of the association's committee on accident prevention and insurance. Mr. Smith wired:

"Cement Association extends best wishes on occasion of your trophy dedication. I know that your entire organization from President Senior to the humblest worker is justly proud and eager to make a perfect record again in 1929. In this effort you have the best wishes of our industry throughout America. The people of Mildred have reason to be proud of their mill. Congratulations."

Mr. John's wire read as follows:

"Sincere congratulations on this red letter day in the history of your plant and city. The entire cement industry is proud of your achievement and extends best wishes on this happy occasion. May you have many more of them."

R. M. Johnson then introduced Alexander U. Miller of Vincennes, Ind., safety engineer of the U. S. Bureau of Mines, who spoke on the value of co-operation. Mr. Miller paid high compliment to the safety work of the portland cement industry and stated that in according it first place in American industry he had no thought of exaggeration or flattery. Mr. Miller stated that safety engineers of the U. S. Bureau of Mines were constantly using the safety work of the cement mills as an example.

Under Mr. Miller's direction an excellent demonstration of proficient first aid work was then given by two recently organized exhibition teams of the Mildred organization. Most of the visitors were amazed at the skill displayed and the proficiency with which the various problems were executed.

At the conclusion of the exhibition, photographs of the groups were taken and the new "June no-accident" flag provided by the Portland Cement Association was hoisted as the band played and the crowd stood at attention with a pledge to keep the flag flying during June and as long thereafter as possible. Refreshments were then announced and the crowd fell upon an inexhaustible supply of ice cream cones and thousands of bottles of soft drinks which had been on ice in large tanks placed in an adjacent building.

J. E. Curtis, general superintendent, Consolidated Cement Corp.

Among the special guests were:

J. E. Curtis, Chicago, general superintendent, Consolidated Cement Corp.
William Palmer, superintendent, Fredonia (Kan.) plant of the Consolidated Cement Corp.
C. A. Swiggett, superintendent, Iola (Kan.) plant of the Lehigh Portland Cement Co.
L. A. Wheeler, superintendent, Bonner Springs plant of the Lone Star Cement Co., Kansas.
James O. Myers, machine shop foreman, Iola plant of the Lehigh Portland Cement Co.

Ask Permission to Sell Pittsfield Lime and Stone Property

HARRY P. LEVOWICH, receiver in the case of Royal Bassett against the Pittsfield Lime and Stone Co. of Richmond, Mass., has filed a petition in superior court asking for permission to sell at private sale all the property owned by the respondent company not covered by liens, attachments or mortgages. He states that he has received an offer of $300 for it from William B. Connors. A hearing was to have been held at Boston, May 14, to show cause why this petition shall not be granted.—*Pittsfield* (Mass.) *Eagle*.

Worker Killed at Gravel Plant

THE second fatal accident within a period of six months occurred recently at the plant of the Zanesville Washed Gravel Co., Dresden, Ohio. When his clothing caught in a whirling shaft at the plant, Granville Cullins, 39, of Trinway, was almost instantly battered to death in the rapidly moving mechanism.

The body was found by fellow workmen in a badly mutilated condition, and was removed to a funeral home in Dresden.

Last fall a workman of the company was killed in an accident in the pit and the accident recently was the second casualty there in six months.—*Zanesville* (Ohio) *Signal*.

Quarries and Gravel Pits Not in the Same Class as Glue Factories and Garbage Works

St. Louis City Ordinance Making Them Public Nuisances Held Unconstitutional—Null and Void

A ST. LOUIS, Mo., quarry operator, Roger Davidson, defied the city authorities and established a quarry in defiance of two sections of the municipal code. He was arrested, tried in the municipal police court, found guilty and fined. He appealed to the St. Louis court of criminal correction, where he was again found guilty and his fine assessed at $100. Refusing to pay this fine, he was committed to jail. Thereupon he appealed to the Missouri Supreme Court for a writ of habeas corpus, alleging that he was unlawfully deprived of his liberty. There was no dispute about the facts. The Supreme Court had to pass upon the constitutionality of the city ordinance. ROCK PRODUCTS published a brief extract of the case and of the decision several months ago. Through the courtesy of Col. E. J. McMahon, executive secretary of the St. Louis Quarrymen's Association, we have been supplied with a copy of the court record.

City Code in Question

The sections of the city code violated read as follows:

"Sec. 1665. No stone quarry shall hereafter be opened, or brick kiln located or slaughter house, glue factory, vitriol factory, soap factory, candle factory, tannery, rendering factory, or garbage works established on any lot of ground or in any building within a distance of three hundred feet of any building, built and inhabited, or any building used as a place of public assemblage before the opening, locating, or establishing of any of the classes of business above mentioned."

"Sec. 1667. Any person, firm, or corporation violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor and upon conviction shall be fined not less than twenty-five nor more than five hundred dollars. Each day such violation exists is hereby made a separate offense.

Court Record of Case

A part of the court record reads as follows:

"The information charges that: 'In the City of St. Louis and State of Missouri, on the 29th day of June, 1928, the said Roger Davison did then and there open and operate a stone quarry within a distance of 300 ft. of an inhabited building, to-wit, city blocks 5094, 5095, located between Drury Lane and Wellington Court, Manhattan and Leamington Boulevards, within the limits of the city of St. Louis.'

"It is claimed by counsel for petitioner that said sections of the ordinance are in conflict with both sections 4 and 30 of article 2 of the Constitution of Missouri, and also with the Fourteenth Amendment of the Constitution of the United States. On the other hand, counsel for the sheriff, who also represent the city of St. Louis, take the position that the above sections of the ordinance are not in violation of any constitutional provision, but that the same constitute a reasonable exercise of the police power of the city.

"[1] I. In this day of greatly increased population of cities and towns, the legislative body of such municipality has the power to make necessary and reasonable regulations regarding the use of the property therein. Often it has been held that such regulation does not deprive the citizen of the use of his property, but simply prohibits him from the use thereof for purposes deemed objectionable. *Sic utere tuo, ut alienum non laedas.* Citations in support of this proposition are unnecessary, it being a fundamental rule of law.

"[2] II. It is true that the necessity, the reasonableness, and the wisdom of an ordinance are matters to be decided by the legislative body of a municipality, yet courts have supervisory power to examine the ordinance and pass on such questions. City of Cartage v. Block, 139 Mo. App. loc. cit. 391, 123 S. W. 483; Baker v. Hasler, 218 Mo. App. loc. cit. 7, 274 S. W. 1095; St. Louis v. St. Louis Theater Co., 202 Mo. loc. cit. 699, 100 S. W. 627; Cooley on Const. Lim. (7th Ed.) p. 280; Beach on Pub. Corp. § 512. And the question may be raised and determined by habeas corpus. Church on Habeas Corpus, § 352.

Rights of Owners

"[3] III. The owner of property has the right to use the same in any manner he may see fit consistent with the rights of others. Hence, the prohibiting by ordinance of the use which the owner may make of private property is taking said property within the meaning of the Constitution. In his work on Limitation of Police Powers, Professor Tiedeman uses this language: 'The constitutional guaranty of protection for all private property extends equally to the enjoyment and the possession of lands. An arbitrary interference by the government, or by its authority, with the reasonable enjoyment of private lands is a taking of private property without due process of law, which is inhibited by the Constitution.' Tiedeman's Limitation of Police Powers, § 122.

Quarry Not a Nuisance

"[4, 5] IV. The question in the instant case is: Has the city the right to prohibit the use of property for a purpose which is not a nuisance *per se* and not injurious to the health, morals, or safety of the community. It cannot be argued that a stone quarry belongs to the same class as a brickkiln, slaughterhouse, glue factory, soap factory, tannery, rendering factory, or garbage works. It is a fact well known, and courts will take judicial notice thereof, that, in the operation of a brickkiln, fires are used and large quantities of smoke discharged through the chimneys; and in the other businesses mentioned objectionable fumes are emitted. The city's legislative body no doubt ascertained that the operation of such establishments within 300 ft. of a residence or building used as a place of public assemblage would be injurious to the health, as well as offensive and injurious to the occupants thereof. In determining this case, it is not necessary for us to consider the reasonableness of the ordinance prohibiting such occupations within such territory. But the sole question we are called upon to decide is the reasonableness and the constitutionality of that part of the ordinance which prohibits the opening of a stone quarry within such prohibited territory. There is much authority in support of the proposition that a city may prohibit from certain territory soap factories, slaughterhouses, livery stables and other business, the operation of which necessarily results in injury to the health, safety, and welfare of the inhabitants of such territory. Tiedeman on Limitation of Police Powers, § 104; Reinman v. Little Rock, 237 U. S. 171, 35 S. Ct. 511, 59 L. Ed. 900; 2 Dillon on Munic. Corp., §§ 690, 692; 2 Kent's Com. p. 340.

"In speaking of a stone quarry, this court said: 'We do not have to go to the books to ascertain that it is not a nuisance *per se*.' St. Louis v. Atlantic Quarry and Construction Co., 244 Mo. loc. cit. 485, 148 S. W. 950. We know of no injury that would result to any one by reason of the opening up of a stone quarry, unless such operation was accompanied by blasting. Of course, the use of explosives in a stone quarry might result, as it often has resulted, in the breaking of glass and plaster, the cracking of walls and other injury to houses, as well as injury to persons; and the noise incident to such explosions interferes with the enjoyment of private homes as well as schools and churches. The ordinance does not prohibit the use of explosives in the operation of a stone quarry, but prohibits the opening up of the stone quarry altogether within such territory. It is a fact well known that a stone quarry may be opened up and operated without the use of explosives, in which event no injury to individuals or to property would result. The information filed against petitioner does not charge him with the use of explosives in the operation of the stone quarry, but simply charges that he opened and operated a stone quarry, following the language of the ordinance.

Employment of Property Cannot Be Interfered With

"In deciding a case where a city ordinance prohibited any person from making excavation in the city for the purpose of removing from his premises any dirt, gravel, or other natural substance in the soil, the Texas Court of Appeals said that such ordinance was unconstitutional, as the excavation, removal, and sale of gravel by the operation of a gravel pit would not be necessarily or even probably injurious to the health, safety, or welfare of the inhabitants. The court further said:

"'We do not see how said gravel pit, properly operated, can be held a nuisance in itself or likely to injuriously affect the public in any manner within the authority of the city in the exercise of its police power to regulate or prohibit. It is true it might be so operated as to render it a nuisance. For instance, excavations might be made so near the public streets, alleys, or passways of the city as to endanger the public in traveling to and fro thereon; explosives might be so used in dislodging and excavating the gravel as to endanger persons or property in the vicinity of such operation; water might be allowed to accumulate and stand in the holes left by such excavation and removal of gravel. None of the same, however, are necessarily incident to such operation.' Stone v. Kendall (Tex. Citv. App.) 268 S. W. loc. cit. 761.

"And in a case where a city ordinance prohibited any person from maintaining or operating a stone quarry within a certain portion of the city, the Supreme Court of California held such ordinance unconstitutional, and in habeas corpus proceeding discharged the defendant. The court used this language: 'The effect of the ordinance absolutely prohibiting the maintenance or operation of a rock or stone quarry within certain designated limits of the city and county of San Francisco is to absolutely deprive the owners of real property within such limits of a valuable right incident to their ownership, viz., the right to extract therefrom such rock and stone as they may find it to their advantage to dispose of. While the use to which a man may put his property may be restricted or regulated by the state, in the exercise of its police power, so far as may be necessary to protect others from injury from such use, it is of course elementary that the enjoyment of one's property cannot be interfered with or limited arbitrarily.' In re Kelso, 147 Cal. loc. cit. 611, 82 P. 241, 2 L. R. A. (N. S.) 796, 109 Am. St. Rep. 178.

"Counsel for the city, in their brief, say: 'It is well known that stagnant waters, breeding insects and germs, usually accumulate in the excavations caused by such operation. These are the ordinary incidents of the activities here prohibited, which we must consider were contemplated by the legislative authority.'

"It may be said that the erection of any building in the city might be delayed for some time, and that stagnant waters, breeding insects and germs would accumulate in the excavations necessary for such building. As a matter of fact, this sometimes occurs; yet it cannot be argued that the city could prohibit the erection of buildings simply because the excavations necessary in connection therewith might result in the accumulation of stagnant waters with the accompanying evil attendants. It must not be presumed that the petitioner would open up this stone quarry in any such manner. If he did, no doubt the city has other ordinances, or will enact suitable ordinances applicable to such condition, if such a condition shall exist. A city cannot prohibit the use by the owner of his property simply because in the use thereof he might do something that would be injurious to others.

"We therefore hold that section 1665 of the ordinance, prohibiting the opening up of a stone quarry within a distance of 300 ft. of any building, built and inhabited or used as a place of public assemblage, is unconstitutional, which entitles the petitioner to his discharge. It is ordered that the petitioner be discharged."

Can Condemn Quarries for Use in Road Construction

A VERBAL opinion of the attorney-general's office given recently to the state road commission held that under state laws that body was empowered to condemn stone quarries for use in the construction of state highways of West Virginia.

The opinion, given by R. Dennis Steed, assistant attorney-general, was in reply to an inquiry of the state road commission made after Senator T. H. Lilly, Hinton, had charged that all available stone near the upper Bellepoint-Hilldale road project in Summers county had been purchased at approximately 5 cents a cu. yd. and that the purchaser had quoted a price of approximately 50 cents a cu. yd. to contractors awarded the contract for constructing the highway. Following receipt of the verbal opinion, Harvey Marsh, member of the road commission, said the Summers county quarries would be condemned.

Steed, who said a formal opinion would be written, called attention to a portion of the state code which gave to the commission "the power to rent, purchase, condemn or acquire by any other lawful means, stone quarries, gravel, clay, sand and other deposits with rights of way thereto." He also cited a portion of the code which provided "the commission may sell any surplus of any such materials, products or equipment to any county or counties or to any municipality of the state, or to any person, firm or corporation at not more than the actual cost or value, exclusively for use in the building of roads, streets or alleys in this state and the commission shall pay into the treasury the funds received therefrom to be credited to the state road fund."—*Bluefield* (W. Va.) *Telegraph.*

Japanese Cement Industry

AT THE beginning of 1929 Japan had 32 cement plants with a maximum annual capacity of 30,132,000 bbl. An increase of capacity to about 36,000,000 bbl. is expected on the completion or construction of several plants at Onoda, Oita, Fujiwara, Tokyo. It is expected that at least one-half of the annual production will be exported, Korea being a favorable market. The Asano company plans to build a cement plant at Korea.

Among the other companies reported interested in new cement projects are:

Tokyo Cement Corp., cement mill at a Tokyo suburb, capacity of 900,000 bbl. per year. The Oriental Engineering Co., Ltd., Tokyo, is reported to have purchased equipment for this plant from American and Danish firms.

Onoda Portland Cement Co., 1,000,000 bbl. plant at Tokushima, Shikoku. Construction reported to have started.

Fujiwara Railroad Corp., cement mills at Miye and Gifu, each of 1,000,000 bbl. capacity.

Des Moines River Excavation Leases in Dispute

A BELIEF that the Iowa state board of conservation has granted leases permitting digging sand and gravel from navigable streams within the corporate limits of Des Moines without authority is contained in a recent ruling by Judge Lester Thompson in the Des Moines district court.

In directing a verdict in favor of the defendant in the case of John T. Beck against the Builders Sand and Gravel Co., Judge Thompson ruled that the board has no authority at law to grant such leases and stated that the right to do so belonged to the Des Moines river front commission.

Both Mr. Beck and the Builders Sand and Gravel Co. were granted a lease by the state board. Beck never operated. The Builders company did and Beck claims the firm encroached upon his leased premises, digging sand valued at $13,500, the amount for which he sued.

The Builders concern has paid to the state a fee of 3 cents a cu. yd. on all sand or gravel dug. Should Judge Thompson's ruling stand, there is a possibility the city is entitled to this tax.

Mr. Beck was equipped with an opinion from John Fletcher, attorney general, when the case opened. It was on the basis of this opinion that he proceeded. The attorney general believes that state board of conservation has the power to grant leases of the type issued to Beck and the Builders company.

The property leased to Beck and that leased by the Builders firm are on opposite sides of the Des Moines river, between the East Sixth street bridge and the span owned by the North Western railroad. Fred Van Liew, city solicitor, said that Judge Thompson's ruling would stand only in cities having a population of less than 25,000 persons. When the population is in excess of that figure, Van Liew says, the authority goes to the state board.—*Des Moines* (Iowa) *Capital.*

Kaw Valley Drainage Board's Sand Plant Dismantled

DISMANTLING of the Kaw Valley drainage board's sand plant at Seventeenth street and Kaw river virtually is completed, Francis Howe, vice-president of the board, said recently.

Bids for selling approximately 10,000 yd. of sand now on hand will be received by the board early in June. Much of the old machinery has been sold, and other equipment stored.

Discontinuance of the plant's operation followed a supreme court order holding that drainage boards could not engage in the business of selling sand. That ruling was obtained in a test suit filed by Arthur J. Mellott at the time he was county attorney. —*Kansas City* (Kas.) *Kansan.*

County Rock Crushing Contracts Awarded in Oregon

THE Washington county, Oregon, court awarded contracts for operating the different quarries of the county as follows:

Bailey quarry: Clifford Sandy, top and base both 95 cents. Cedar canyon: Clifford Sandy, top and base $1.05. Hazeldale: P. G. Hogan, top 88, base 87 cents. Hergert: L. J. Holtz, top and base both 94 cents. Hoffman: Jeppsen Bros., top and base both 90 cents. Pumpkin Ridge: Seth Sandberg, top and base both $1.45. Rupprecht: Holm, Erickson & Broseth, top and base both $1.14. Heaton: J. Tekoff, top and base both 81 cents. Jackson: Herman Bishop, top 92, base 72 cents. Laurel: J. Tekoff, top and base both 92 cents.

Prices are for producing the rock in quarries and with machinery owned by the county. Commissioner Hiatt says that the average of prices is slightly below those of 1928.—*Hillsboro* (Ore.) *Independent.*

Eastern Silica to Expand

EASTERN SILICA AND CHEMICAL CORP., Gore, near Winchester, Va., will soon begin installation of crushing machinery, mechanical washers, chaser mills, conveying apparatus, and other equipment in connection with general expansion now under way. Work has been started on a new tipple. An electric power station will be built for service at mines and mill. Entire program is estimated to cost about $125,000.

Philippines Order Idaho Phosphate

THE IDAHO AMERICAN PHOSPHATE CO.'S rock phosphate deposits near Bear Lake, Idaho, are to be developed within a short time, according to H. B. Dyer, sales manager of the company, in a recent report in the *Nampa* (Idaho) *Free Press.* Plans are under way for a crushing and pulverizing plant, Mr. Dyer stated.

Inquiries and orders for Idaho phosphates are said to be coming in, a recent order from the Philippine Islands calling for 100,000 tons. This will be shipped in 100 lb. sacks. Prevailing price quotations are given at $22.50 per ton f.o.b. Portland.

The Idaho company was incorporated last March, with general sales offices in Portland. H. D. Jackson of Nampa is president and engineer; J. A. Arment, vice-president; V. S. Rodman, secretary and treasurer; H. B. Dyer, general sales manager.

Indiana Quarry Land Sold

ANNOUNCEMENT of the sale of 200 acres of land south of Bloomington, Ind., to Carl Furst, of the Furst-Kerber Co. has been made in the *Indianapolis* (Ind.) *News.* It is understood the transaction was made for the consideration of $50,000, or $250 an acre. Core drilling was made on the farm before the sale and it was found that it contains a good quality of building stone. The purchase was made from Miss Pearl Neeld.

Standard Products to Start Lime Operations

ANNOUNCEMENT has been made by the Standard Products, Inc., of Medford, Ore., recently organized and incorporated, that work would start shortly on the installation of machinery and the erection of warehouses for the production of lime and agricultural limestone at the Cameron quarry, three miles from Ruch.

According to J. H. Weber of Los Angeles, Calif., the Southern Pacific railroad has granted a freight rate of 37 cents per 100 lb. on lime and kindred products and a rate of 25 cents per 100 lb. on fertilizer to California points. The old rate was 68 cents per 100 lb. A parity rate to Portland and northwest points has also been granted.

The concern will erect a lime burning kiln and limestone crushers at the quarters, and erect a warehouse at Ruch. Other storage houses for the products will be provided at Medford.

The lime plant plans to use waste slabs from the Owen-Oregon limestone quarry operation.

The plant has been capitalized at $60,000. J. H. Weber of Los Angeles and T. H. Callaghan of this city are organizers of the industry. They expect to expend between $40,000 and $50,000 in the construction of the plant.—*Medford* (Ore.) *Mail-Tribune.*

Finnish Cement Industry

EXTENSIONS to the largest cement plant in Finland, Pargas, were started sometime ago, and now the second largest Finnish cement plant, Lojo Kalkbruk, is to be enlarged from 650,000 bbl. to 1,100,000 bbl. annual capacity. The lime producing facilities will also be expanded.

Oregon Company Adds Unit for Lighting Standards

THE CONCRETE PIPE CO., Portland, Ore., has recently added special machinery and commenced the manufacture of Marbelite lighting standards, according to Clyde Grutze, manager. These standards are centrifugally cast and strongly reinforced with drawn steel bars, providing a strikingly beautiful appearance, together with great strength.

In general appearance Marbelite standards are a neutral gray in color, said to harmonize with any environment and requiring no washing, painting or any other maintenance of a like nature. In design, classical lines have been followed, and at a cost no higher than other varieties.

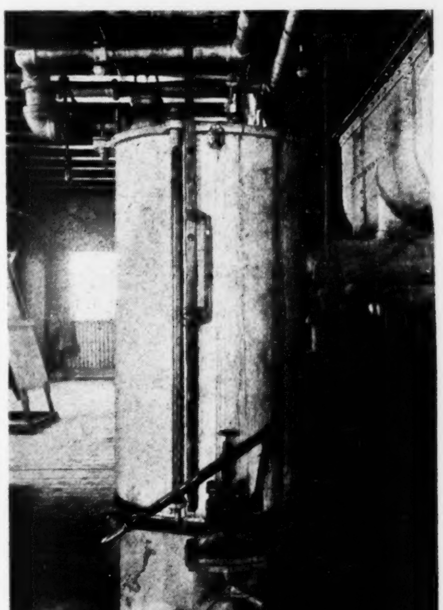
Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

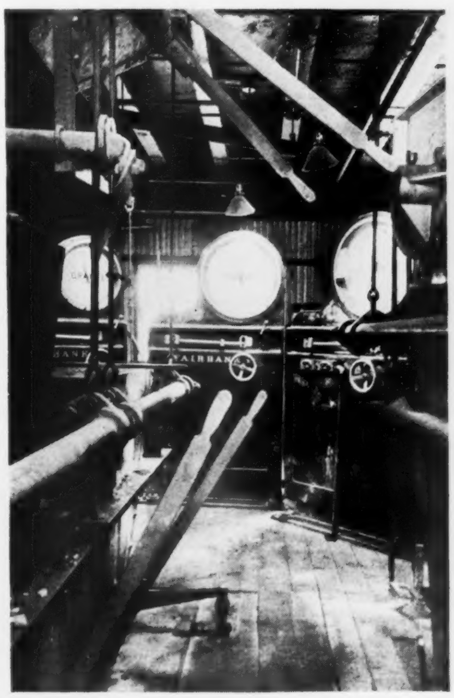
Pittsburgh Ready-Mixed Concrete Plant Operated by Four Aggregate Producers

Co-operative Enterprise Permits One Large Economical Operation Capable of Meeting Peak Loads

THE READY-MIXED CONCRETE CO., Pittsburgh, Penn., is the largest operation of its kind in that city and one of the largest in the east. The company is a result of the four largest sand and gravel producers' determination to take advantage of the commercial possibilities of a ready-mixed concrete plant in such a manner that a reasonable profit could be assured and still deliver ready-mixed concrete at a price favorable to the contractor or user. They realized that with each company trying to operate an individual plant, costs would be excessive, for each plant would have to be of sufficient size to take care of peak loads of building construction in the Pittsburgh district. Each company would also need a plant of sufficient mixing and storage capacity in the downtown section where land is extremely valuable, as well as a fleet of trucks for transit-mixing, carrying, etc. Four mixing plants, any one of which should be capable of handling peak periods at any construction job likely to develop in that section would mean four plants operating only a part of the time, and unprofitable, for apparent reasons.



Water measuring tank with scale for reading water needed for different concrete mixes



Scale dials are located near the operation levers to facilitate control

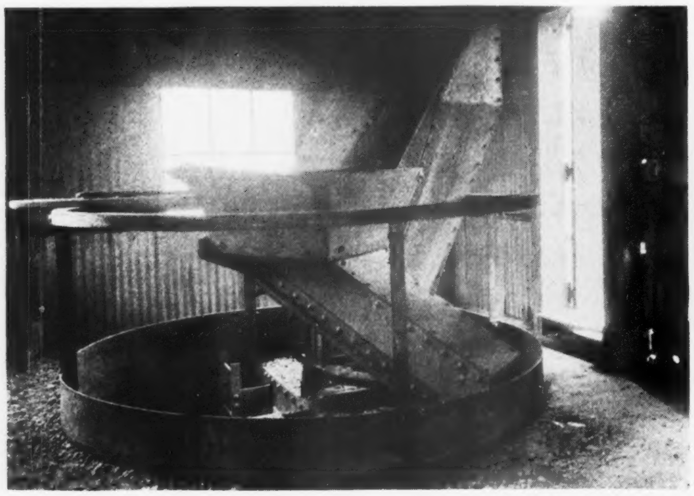
Central concrete mixing plant operated as the Ready Mixed Concrete Co. by four sand and gravel producers at Pittsburgh

Thus the J. K. Davison and Bros., the Iron City Sand and Gravel Co., the Keystone Sand and Supply Co., and the Rodgers Sand Co. pooled their interests in the ready-mixed concrete business and incorporated the Ready-Mixed Concrete Co., of Pittsburgh, Penn., building their co-operative plant in the heart of the downtown section of the city, at 27 Barbeau St. These four sand and gravel companies are the largest in Pittsburgh and considered as a unit their outputs would approach 12,000,000 tons per year, making the aggregation one of the largest in the world.

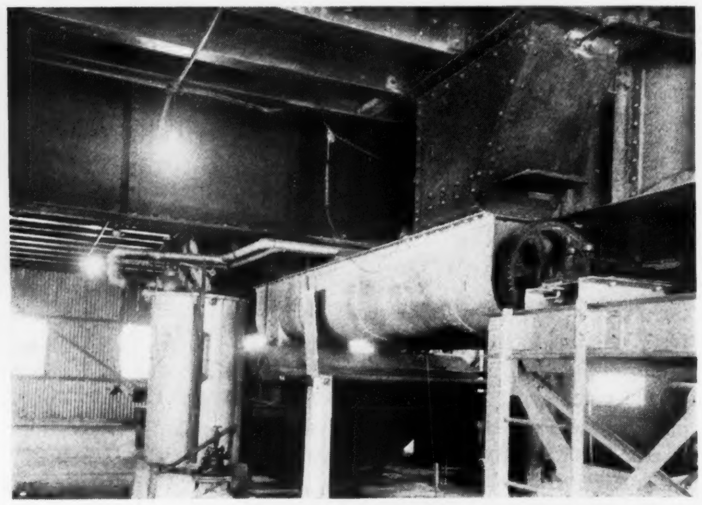
This plant has a capacity of 650 cu. yd. per ten-hour day, and no order is too large or too small to be handled by the company, as they have 9 Barrymore mixer trucks and 21 Bartlett Snow bodies mounted on Mack, Republic and White trucks.

The price received for this material is based on the cement ratio, type of cements and gravels, on the distance hauled and the amount to be delivered. Each job is considered a separate problem, and when all the information is at hand covering these

variables, a quotation based on costs of the material used, distance hauled, operating costs, plus a fair profit, is given. For this reason the selling price per yard does not convey all the necessary information as to whether other companies contemplating entering this field could operate at a profit; however, the price, with the above considerations in mind, ranges from $8.00 to $15.00 per cu. yd. delivered in the closer zones.



Above — Distributing spout for sand and gravel



Below—One of the cement distributing screws

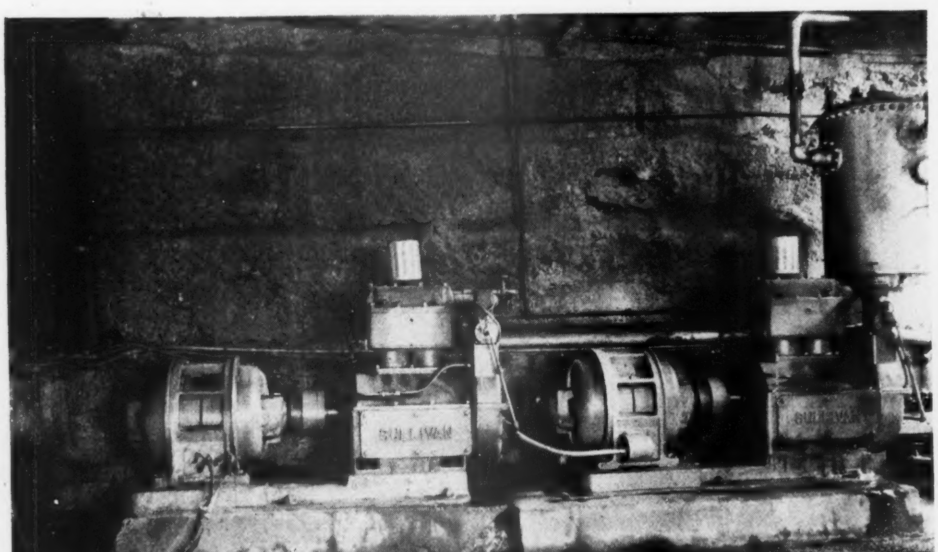
There is no particular obstacle to overcome for a sand and gravel or crushed stone operator to figure his costs, as the items that go to make up the total are no secret but are definite, tangible items of manufacturing expense. A fair class division of cost can be made by a good knowledge of the costs of sand, gravel and cement to make 1 cu. yd. of concrete for the standard cement-sand-gravel ratios.

The equipment in the plant consists of a Stephens-Adamson power shovel for unloading bulk cement to the 4-in. Fuller-Kinyon pump, a Bartlett and Snow bucket elevator for sand and gravel, three Fairbanks-Morse springless scales for weighing cement, sand and gravel, one 3-yd. Ransome mixer, and two Sullivan compressors equipped with Staynew air filters. Two 60-hp. Erie boilers supply steam for heating the aggregate for winter work.

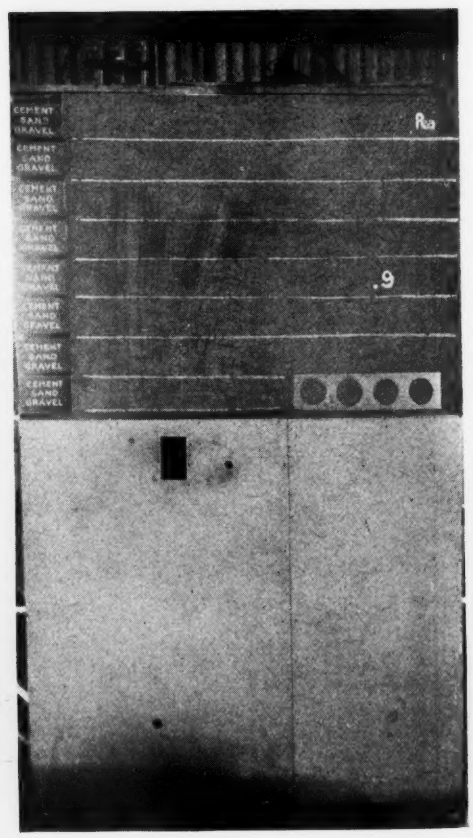
A total of 168 hp. is used in operating the entire plant, distributed as follows: two General Electric motors on compressors, 50 hp.; elevator, 20 hp.; cement pump, 20 hp.; mixer, 60 hp.; two Westinghouse motors on cement screens, 15 hp., and a 3-hp. Century motor on boiler feed pump.

The most unusual feature of this plant is the method of communication between the office and the mixer operator. In the office is a switchboard or panel made up of a series of switch plugs and by inserting plugs in the desired receptacle, a number is flashed to the mixer operator on a ground glass panel close to his controls. A separate plug in the office is used for eight different cement-sand-gravel ratios, two cement-sand ratios, six water ratios, three kinds of gravel, a stop warning and a telephone signal. The board is also arranged to communicate the number of yards of concrete to prepare and whether admixtures of lime, Fluxite, Truscon, Garland, or other waterproofing compounds are to be used.

To illustrate, if an order calls for 2 cu. yd. of 1:2:3 concrete with a water-cement



Air compressors for the cement pumps



Mixing control panel in the plant

ratio of 0.9 using pea gravel, then by inserting the plugs in the receptacles for this mix the order will be shown in the plant

on the ground glass, giving the weight of cement (in pounds) to be used, weight of sand, weight of gravel, water ratio and gravel to use. At the time the photograph was taken pea gravel, with a water ratio of 0.9 was requested for an order.

The amount of water required for any given ratio and yardage is obtained from an interpolating table alongside of the water measuring device.

The sand and gravel flow by gravity to their respective weighing hoppers and the cement flows through a non-flooding screw conveyor. The scale dials and the control panel are always within sight of the single operator required to run the plant.

Special Delivery Trucks

Another feature of interest is the development of a non-mixing truck body for hauling wet mixed concrete, the basic principle being to re-mix any settled aggregate, through three distinct movements of the mixture just before dumping. The body of this truck is built in the form of a "V," the apex so constructed that the sides can move outward at the bottom thus giving the truck's body vertical sides. This is the first movement the mix receives and might be described as a slump movement. The second movement is secured by tilting the body upwards in the dumping position, and the third by opening a wide gate at the bottom and converging the stream of concrete to a narrow chute as it emerges from the body of the truck. These three movements are sufficient to offset settlement incidental to short hauls, it is claimed.

A second type of truck holding ½ cu. yd. of concrete has been designed by the company for transporting small deliveries.

The plant was designed by the Pittsburgh Engineering, Foundry and Construction Co., Pittsburgh, Penn.

Personnel

The officers of the Ready-Mixed Concrete Co. are: Alex W. Dann, president; George Vang, vice-president; E. K. Rogers, secretary; H. S. Davison, treasurer; J. E. Burke, general manager, and H. S. Youndt, superintendent.

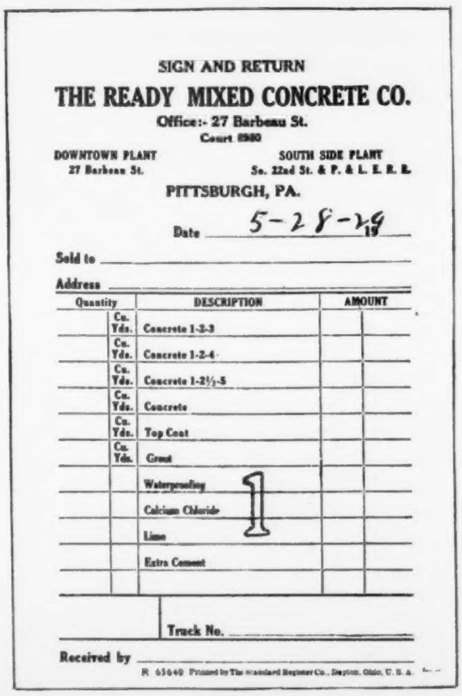
Piedmont Quarries to Open Ready-Mixed Plant

ACCORDING to recent announcement in the *Winston-Salem* (N. C.) *Sentinel,* the Piedmont Quarries is planning to open a central ready-mixed concrete plant at its quarry property at Waughton, N. C. A fleet of delivery trucks, rotating-body type, have already been ordered, the report states.

The Piedmont Quarries is a merger of the Cox and Perkins Co. and the Piedmont Quarries and is one of the largest rock quarries in the section. State convicts are employed in getting out the stone, a regular camp being maintained near the quarry by the state.

Kansas City Ready-Mixed Concrete Plant Damaged by Fire

RECENT FIRE caused damage to the crushing plant operated by the Ready-Mixed Concrete Co., Kansas City, Mo., entailing a loss estimated at $40,000 to $50,000.


SIGN AND RETURN

THE READY MIXED CONCRETE CO.

Office:- 27 Barbeau St.

Court 1980

DOWNTOWN PLANT 27 Barbeau St.

SOUTH SIDE PLANT So. 22nd St. & P. & L. E. R. R.

PITTSBURGH, PA.

Date 5-28-29

Sold to

Address

Quantity		DESCRIPTION	AMOUNT	
	Cu. Yds.	Concrete 1-2-3		
	Cu. Yds.	Concrete 1-2-4		
	Cu. Yds.	Concrete 1-2½-5		
	Cu. Yds.	Concrete		
	Cu. Yds.	Top Coat		
	Cu. Yds.	Grout		
		Waterproofing		
		Calcium Chloride		
		Lime		
		Extra Cement		

Truck No.

Received by

R 65640 Printed by The Standard Register Co., Dayton, Ohio, U. S. A.

One of the order delivery forms in use at the plant

The plant was in operation when the fire was discovered. E. L. Snyder, secretary and treasurer of the company, said its cause had not been determined. The plant, in operation under its present management about a year, was the only one operated by the company and will be rebuilt immediately, Mr. Snyder said. It will not be necessary to cease concrete mixing, Mr. Snyder said, as arrangements were made to obtain crushed rock elsewhere temporarily.—*Kansas City* (Mo.) *Star.*

Crescent Cement to Keep Its Present Name

ANNOUNCEMENT is made of the expansion of the Medusa Portland Cement Co. (formerly the Sandusky Cement Co.) by the purchase of more than 90% of the capital stock of the Crescent Portland Cement Co., Wampum, Penn. The Wampum plant will be operated under its former name, and no drastic changes are contemplated. The Medusa Portland Cement Co. recently increased its capital stock from 75,000 to 225,000 shares and stockholders voted a two-for-one split.

A new board has been created and the following officers elected: J. B. John, president; E. J. Maguire, vice-president and treasurer; and Fred Pickford, secretary. All of these men are officers of the Medusa Portland Cement Co. of Cleveland, Ohio.

Workability of Slag Concrete

SYMPOSIUM NO. 16 of the National Slag Association, Cleveland, Ohio, is one of a series pertaining to the physical characteristics of blast furnace slags. This particular pamphlet gives a large number of abstracts concerning the workability, yield and voids of concrete using crushed slag as an aggregate.

These symposiums are of extreme value and interest to the whole industry, as they are carefully prepared and easily read. So far there have been a total of sixteen symposiums prepared which are available to members of the association and to various committees of technical organizations.

Small capacity truck used to deliver small batches of ready-mixed concrete

Delivery truck which has no agitators but makes a re-mix at time of dumping

International Gypsum to Build Plant at Savannah

ACCORDING to press dispatches from various Savannah newspapers, the International Gypsum Co. has decided on Savannah, Ga., as the location for a gypsum products plant to cost about $150,000 and employ 200 men. The site has not yet been selected, but it is probable that it will be on the waterfront, because of the company's intention to use Canadian gypsum, mined in the interior of Cape Breton Island, N. S. Construction of the mill is scheduled to begin this year, the reports state.

Atlanta is to be the executive headquarters and warehouse site, stated Mullen, Ellis and Co., Ltd., of Canada, representatives of the International Gypsum Co. This was announced at a recent weekly luncheon of the Kiwanis Club of that city, at which the honor guests and principal speakers were A. W. H. Mullen, president; Eric E. Ellis, vice-president; Capt. M. W. Waller, engineer, and W. A. Noes, sales engineer of Mullen, Ellis and Co., who have been touring large cities looking for a favorable site to locate a large gypsum plant.

In his talk Mr. Mullens stated that Atlanta had been definitely selected as the distributing center and executive offices and that Savannah had been selected as the most logical site for a large manufacturing plant. The Savannah plant will be on the river front and will have unexcelled railroad facilities and also excellent water connections to all points on the east coast.

Captain Waller stated that the International Gypsum Co., Ltd., which his company represents, is the largest of its kind in the world and owns on the banks of Big Harbor, Island Point, Nova Scotia, large deposits of every grade of gypsum, there being over 12,000,000 tons of it above the water line. Mining is a simple proposition and in many places large ocean boats can get close enough to the island to load directly into the boats, Mr. Waller said.

The geographical location of Atlanta and its distributing facilities in respect to southern cities were the chief factors in deciding on that city, Mr. Ellis stated in his talk. Traffic movement of raw material from Canada, Mr. Noes, sales engineer for the Gypsum company, stated, will mean a fleet of boats plying between Island Point of Bras d'Or Lakes and Savannah and from 1200 to 1500 cars of additional freight into Georgia.

Everist Company Buys Simpson Quarry at Dell Rapids, S. D.

THE L. G. EVERIST Co., Sioux City, Iowa, has purchased the Simpson stone quarry east of Dell Rapids, S. D., for $21,000. The company has had the quarry leased the past two years, with an option to purchase at the end of two years. The purchase was made at the expiration of the leasing time.

Many improvements have been made at the quarry, as it was understood the company intended to purchase it. Another crusher has been added and the company has been shipping a large quantity of crushed rock to be used in Sioux City and at Charter Oak, Iowa. It is expected that a large force will be employed this summer. —*Sioux City* (Iowa) *Tribune*.

Premature Blasts Kill Six Men at Two Quarries

AN INVESTIGATION into the cause of the recent blast at the Wisconsin Granite Co. quarry at Sioux Falls, S. D., which killed three men and injured three others, was begun when a coroner's inquest was held at the chapel room of the Miller funeral home.

Albert Abraham, Louis DeBella and Jack Johnston were killed in the accident and Louis Vargas, Chester Ruud and H. J. Gallagher, superintendent of the quarry, were seriously injured in the blast, which, as testimony given at the inquest was beginning to confirm, was believed to have resulted from the explosion of a "dud" left in an old drill hole at the southwest corner of the quarry.

All of the men injured in the accident were present to testify. Mr. Gallagher had been released from the Moe hospital.

Workmen at the quarry at the time of the blast described the scene of the accident both before and after the accident but added nothing of consequence to that which was already known.

A number of women wept as descriptions of the accident scene was given after the blast had occurred. Numerous relatives of the men and officials of the Wisconsin Granite Co. were present at the hearing.

Despite the fact that Mr. Vargas and Mr. Ruud have been confined to beds at the Moe hospital, they were brought to the inquest in an effort to determine the cause and responsibility for the explosion. Shortly following the accident neither of the men could remember a great deal concerning it, except that they were drilling in an old hole and that they probably hit a charge of dynamite which had been left there at a previous time.

The theory of an exploding "dud" was contradicted by Mr. Gallagher, when called on to testify, when he stated that the workmen were filling the hole and had between 150- and 200-lb. of explosive loaded into the hole when the explosion occurred.

All of the injured men would recover, the attending physicians stated. Mr. Gallagher, who was in charge of the men working at the scene of the blast, has already returned to work at the quarry. This is the first accident of this nature to happen during the 35 years Mr. Gallagher has been working with quarry explosives, according to reports.—*Sioux Falls* (S. D.) *Argus*.

* * *

Premature explosion of a 600-lb. charge of dynamite killed three quarrymen, gravely injuring two others and tore 1000 tons of rock from the Belmont-Gurnee Stone Co.'s quarry at North Bergen, N. J., according to a dispatch in the *Chicago* (Ill.) *Daily News*.

March Company to Operate Oregon Limestone Quarry

OPERATIONS by the March Construction Co. of Spokane of the lime rock deposits recently leased from the Oregon Lime Products Co. will begin sometime in June, according to Harry M. Wirt, manager. The company, which leased the plant on a royalty basis about a month ago, has had a crew at work since that time installing crusher equipment and getting ready for operations.

The output will be chiefly agricultural lime, with chicken grit as a side line. The plant has a capacity of 300 tons per day of pulverized lime rock.

The quarry and plant are located on what is known as the cement spur near the Oregon Portland Cement Co.'s quarries lying a short distance north of the Dallas-Falls City road, about three miles from Falls City, Ore.

It is planned to handle the deliveries within a radius of 20 miles by truck, the company making delivery if desired. For greater distances shipment may be made by freight, as trackage facilities are available.

The company is placing a price of $3 per ton at the plant on the agricultural lime. It will operate a crew of a maximum strength of 30 men when operations are under way. —*Dallas* (Ore.) *Observer*.

Russian River Gravel Permit Granted

RIGHTS to remove gravel from more than 1334 acres of land along the banks of the Russian river between the ocean and Duncan's Mills has been secured by the Russian River Improvement Co., from land owners, according to agreements filed with the county recorder.

The Russian River Improvement Co., is constructing a small jetty at the mouth of the Russian river off Jenner in order to provide a channel the year round for entrance of steam vessels and barges to handle the gravel which is to be used for building purposes in the bay cities. Removal of gravel is expected to be begun within a short time and continue throughout the summer season this year.—*Santa Rosa* (Calif.) *Republican*.

A New System of Coal Drying

Utilizes Radiated Heat From Kiln Shell

AN ENTIRELY NEW FORM of dryer has been recently designed utilizing the waste heat which is radiated from the outer shell of a rotary kiln. By utilizing this heat coal used for firing can be dried by the kiln itself. The equipment also can be used for drying shale or limestone in dry-process cement plants, or for that matter it finds adaptation to any drying problem where a rotary kiln or cooler is used in the process.

The dryer consists of ten or more compartments, the number depending on the diameter of the kiln, which are attached around the circumference of usually the lower end of the kiln or cooler. These compartments are separated from the kiln by air spaces through which air is passed and pre-heated, and this air is then drawn into the compartments containing the material to be dried.

In addition the compartments are so designed that they are heated on the bottom and two sides by the radiated heat from the shell proper, drying being facilitated by angled projections in the compartments which lift the raw material and drop it through the preheated air stream four times each revolution of the kiln.

The discharge pipe carrying away the moisture and fine coal dust from the dryer can be passed back into the kiln as preheated air for combustion, then effecting a second fuel saving, as this air is heated to between 150 and 200 deg. F.

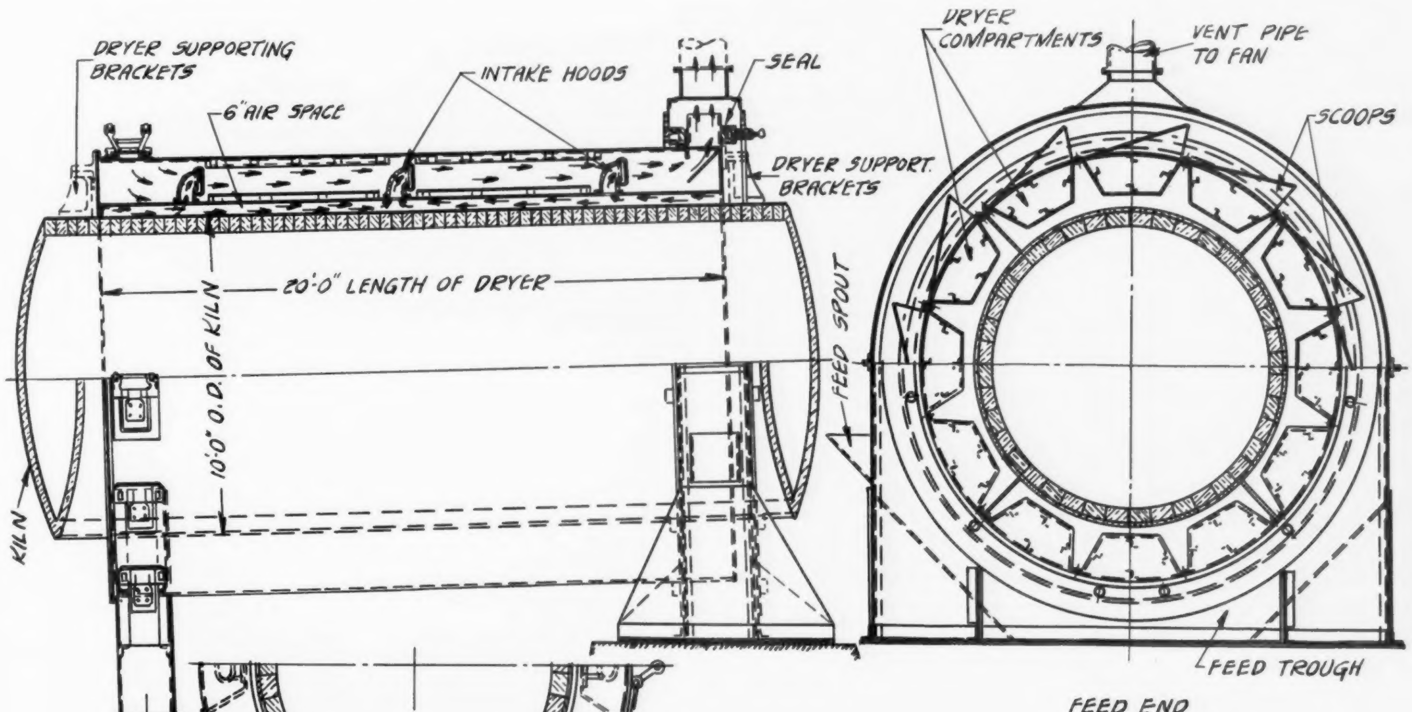
The material can be fed to the dryer by a gravity feed or by scoops so placed as to scoop the material from a feed trough placed under the kiln. The dried material is trapped out of the dryer by automatically operated gates that are so designed as to prevent cold air entering the compartment except for a fractional second during the discharge period.

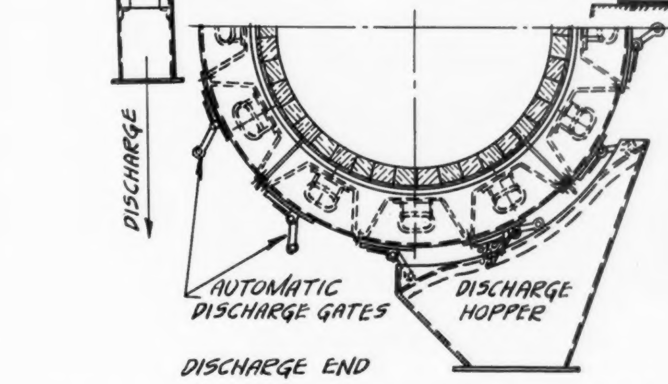
These dryers can be attached to any rotary kiln where a radiated heat of 200 to 300 deg. F. is thrown from the shell. For coal it is not advisable to attach the dryer over the hottest part of the kiln, as the temperature of the radiated heat may be too high at this zone.

It is claimed that owing to the method of attaching the dryer to the kiln and to the balanced load thus carried that no additional power is required to operate the kiln, that repairs are practically negligible, and that it requires no extra labor to operate. As the dryer is under a slight vacuum at all times, the operation is practically dustless and eliminates the possibility of explosions. In the event the power goes off, means are provided for preventing overheating of the coal in the compartment, with no danger of coal fires in the dryer.

Several of these installations have been installed in connection with the Haydite (light, burned-clay aggregate) industry and have been in successful operation for months with no process or mechanical troubles developing. One of these installations, it is claimed, dried coal to its rated capacity containing 14% moisture, this coal being fed direct to pulverizers, where it was all pulverized to pass a 200-mesh screen.

This unusual dryer was developed by Jones and Hartman, Inc., engineers, Canton, Ohio, who also designed and manufacture a coal pulverizer and feeder that is recommended to be used in connection with their dryer.





Coal or raw materials dryer using waste heat radiated from kiln shell

Air-Swept Coal Pulverizer

The mill is of the ball mill type and was designed to supply a simple, slow speed, continuous and economical pulverizing operation, it being claimed that 12 to 14 kw. per ton of coal is all the power required to grind

the product to 50- to 250-mesh. The mill has a capacity of from one to six tons per hour and is so designed that the same labor used for operating the kiln can take care of the pulverizer as well. Other claims made by the designers include: Accurate and quick control of fineness; automatic feed; compactness and rugged construction which permits a repair cost of less than two cents per ton of coal ground, and dustless operation. The mill has capacities of 1000 to 12,000 lb. of coal per hour.

The mill has cast-steel end heads, heavy plate cylinder, and is mounted on two large trunnions, cast integral with the heads. These trunnions are supported on heavy bearings with renewable bronze bearing shells, the bearings being supported on heavy pedestals, mounted on a cast iron base on concrete piers.

The mill is compact, requires little floor space, and can be driven with pulley and belt, Allis-Chalmers "Texrope" drive, or silent-chain drive.

The mill is under a vacuum at all times, the collector being located between the fan and the dryer. The collector is so designed as to control the air by bypasses which not only regulate the fineness of the discharge coal but provide a means of adjustment to maintain the proper air-coal ratio for subsequent kiln firing.

The mill is equally efficient when grinding limestone screenings, clay or shale, lime, gypsum, fuller's earth, marl, phosphate rock, paint pigments, chemicals, etc., to any desired fineness, it is claimed.

Powdered Coal Feeder

The new Jones and Hartman coal feeder is claimed to have improvements over the old type of feeder, but still retains the basic principles of the present-day equipment.

These feeders consist of three double flight or pitch conveyors, driven by a single worm on the driving shaft which engages three bronze worm gears fastened to the conveyors.

This method turns all three conveyor screws in the same direction, so that all the conveyors are the same hand or lead, and one extra conveyor in stock will make a replacement in case of accident.

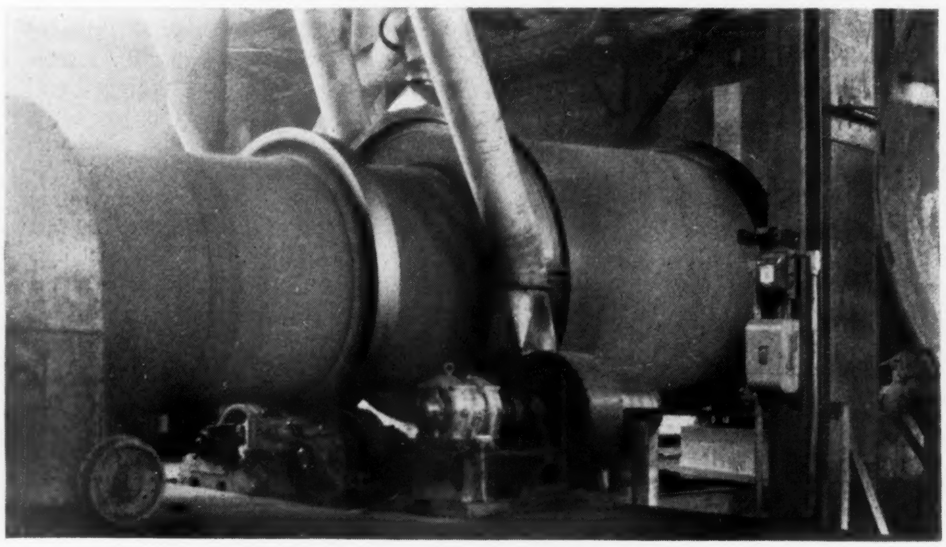
By use of three conveyors of double pitch, six deposits of coal are delivered at every revolution of the conveyors, which assures a steady, uniform flow of coal to the burner pipe, and a clean, uniform fire with pulsations reduced to the minimum, which in a great many cases is a source of annoyance and loss in combustion efficiency and economy.

Located in the feed hopper immediately above the conveyors are two agitating shafts provided with agitators which keep the coal agitated all the time, and insure a steady and constant feed to the conveyors, and prevent the powdered coal from arching over the conveyors.

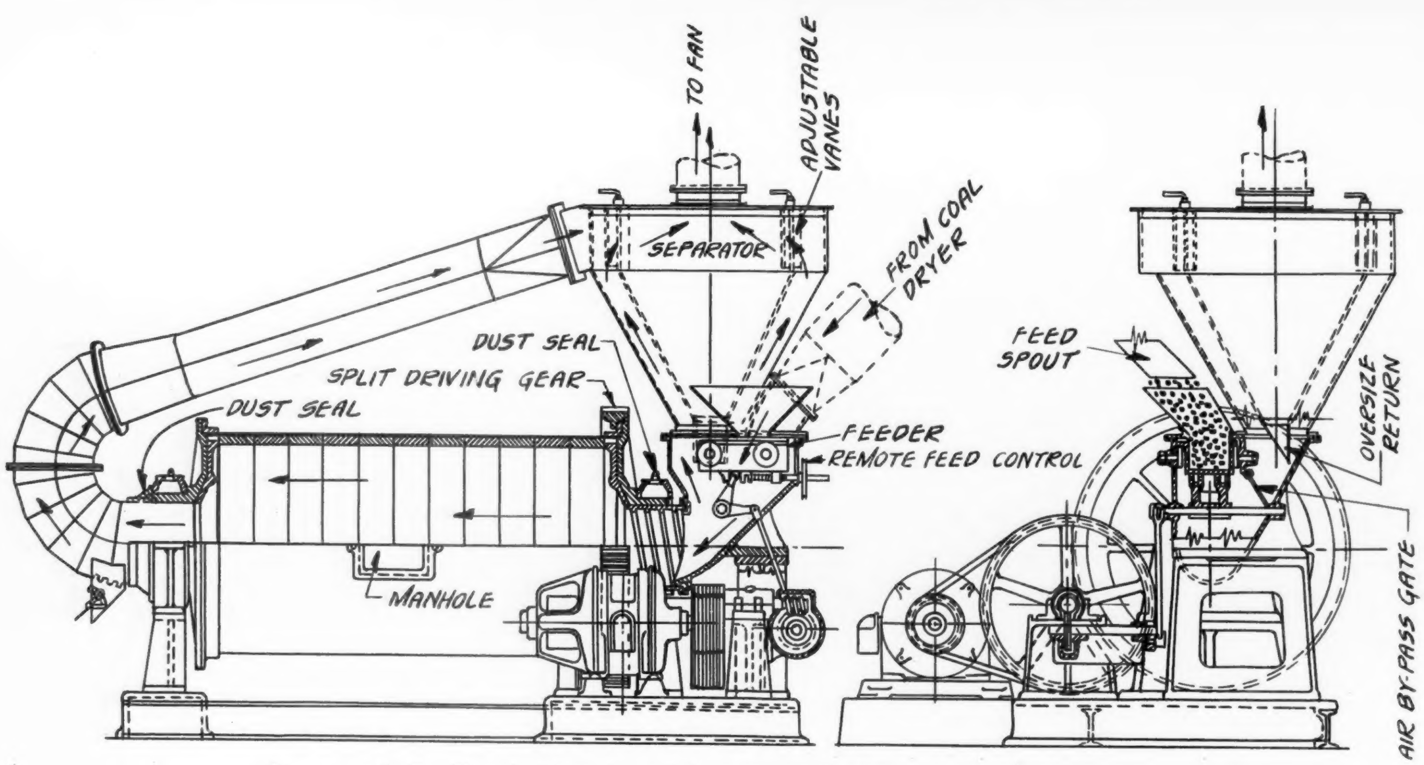
This overcomes one of the most prevalent troubles in feeding powdered coal, and assures a constant and uniform flow of coal at all times.

These agitators are driven by worm gears from the same worm that drives the conveyor screws, so that the agitators are always in operation whenever the conveyor screws are working.

A tramp iron pocket is provided in the bottom of the feed hopper, so that any tramp



Installation of kiln waste-heat coal dryer



Air-swept ball-mill pulverizer for coal or raw materials in cement manufacture

iron such as nuts and bolts that should find their way into the coal bin, will be deposited into this pocket and not cause damage to the conveyor screws.

The coal as it leaves the conveyor drops to a mixing valve where air from the fan picks it up and delivers the dust to the burner. The valve is provided with a swivel joint which permits turning of the burner pipe in any angle, thus making it possible to change the direction of the flame in the kiln.

A variable speed drive controls the rate of speed and a revolution counter gives a check on the coal being consumed. The feeders are made in capacities from 300 to 20,000 lb. per hour.

Old Established Paint Company Makes Additions

THE JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J., announce several important changes in their line of paints.

Dixon's industrial paints, known for more than 65 years as Dixon's silica-graphite paints, have been increased in range of colors from eight to 14 colors, which include a straight aluminum paint and also a standard red oxide paint. This color range meets in a most complete way all standard color requirements for metal and wood protective coatings.

Dixon's utility paints have been added as standards, three of which are graphite-pigmented, the fourth, oxide of iron.

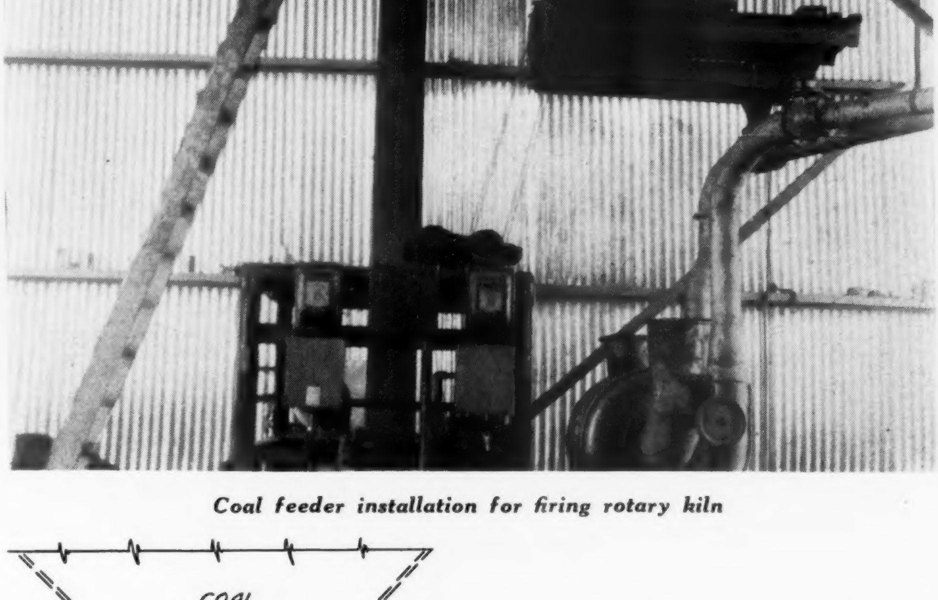
Dixon's maintenance floor paints have been developed for the protection of wood, composition, linoleum, cement and concrete floors.

Electronic Tornado Welder for Welding Small Tanks

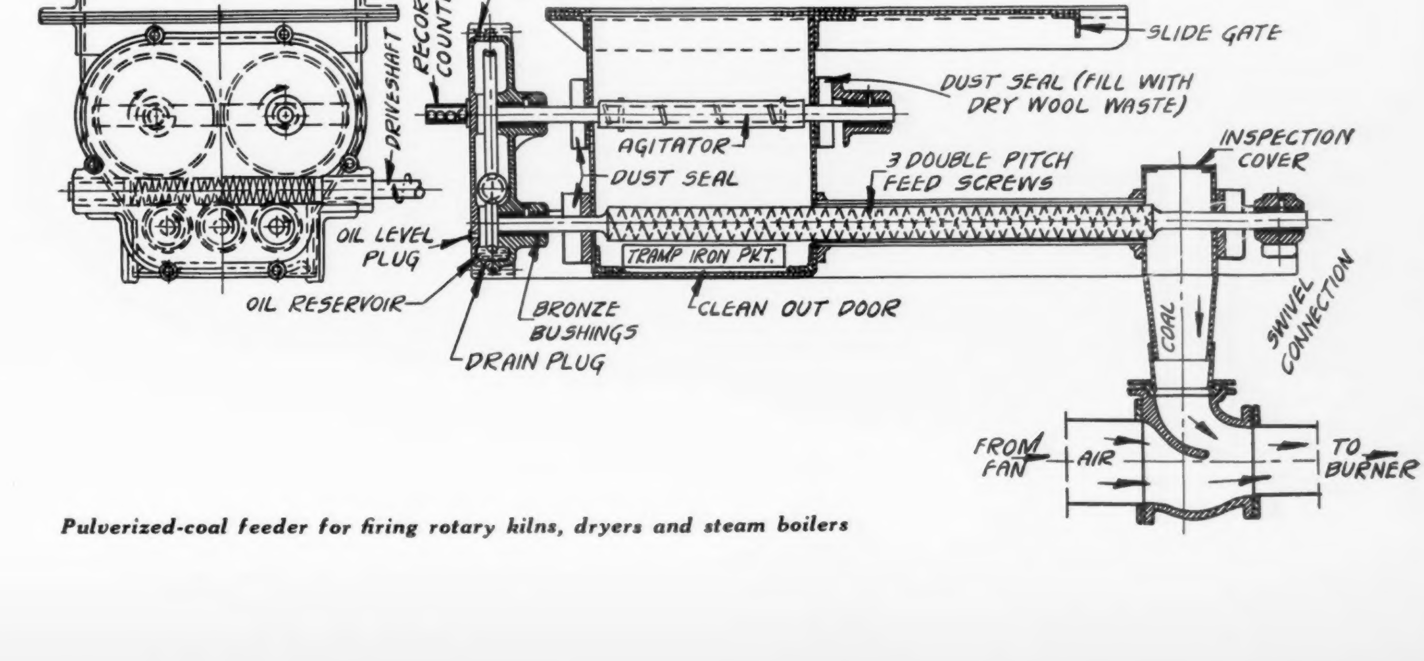
A NEW automatic arc welder for welding the heads in small tanks, such as oil and gas tanks or range boilers has been announced by the Lincoln Electric Co. of Cleveland, Ohio. The new unit utilizes the electronic tornado principle.

New automatic electric arc welder for welding heads of small tanks especially

According to the manufacturers announcement, this machine is characterized by its extreme simplicity. The holding fixture consists of a rotating table driven by a small variable speed motor and a vertical support carrying a fixed steady rest and the welding head. The electronic tornado welding head is flexibly mounted so that the length of the arc is at all times under the control of the operator. The chief advantages claimed for this machine are high welding speeds and smooth uniform welding speeds. Speeds of 100 to 150 lineal feet per hour are claimed. In making an edge weld, as illustrated in the photograph, no additional filler metal is used. The heat of the carbon arc fuses the edges of the cylinder shell with the flange of the dished head making a leak-proof joint.



Coal feeder installation for firing rotary kiln



Pulverized-coal feeder for firing rotary kilns, dryers and steam boilers

AIR BY-PASS GATE

New Type of Cement Slurry Filter

THERE is a widespread belief that automatic machines are an assembly of parts subject to quantity production. In no field of industry is there a greater refutation to this belief than in the use of automatic filters for the dewatering of cement slurry, according to the Filtration Engineers, Inc., Newark, N. J., who state further that chemical analysis, water content, fineness of grinding and similar specifications of a cement slurry may not vary greatly and yet the filtrability of any two slurries is liable to vary as much as 4:1.

The Filtration Engineers, Inc., Newark, N. J., are manufacturers of the "FEinc" filters, which have been introduced into the portland cement industry during the last year or two for filtering slurry in wet-process mills. This filter is of the vacuum, drum type. The filter cake is removed from the drum by a compressor belt, of canvas, driven by contact with the filter cake as the drum rotates. This compression belt, it is claimed, closes up cracks in the filter cake and thus reduces the size of the vacuum pump that otherwise would be required. It is also claimed that the pressure of this belt on the filter cake squeezes out some of the moisture left in the cake.

The filter cake after treatment under the compression belt is reinforced with endless strings and after the vacuum is cut off and atmosphere admitted to the vacuum compartment the strings carry the cake off the drum in a sheet or slab, making a scraper unnecessary. The strings are said to be readily replaceable by a patented method.

The obvious duty of dewatering equipment is removal of water from the slurry. It is physically impossible to completely dewater to zero moisture by mechanical means. Yet as the coal savings to be realized by filtration are a direct function of the amount of water removed, filters must be designed, and in a rugged practical way, to deliver the dryest possible cake. To obtain a cake containing 18% moisture instead of 20% can easily mean a 10% increase in water removal, and a like increase in coal savings. It is these added savings which are today becoming more and more important.

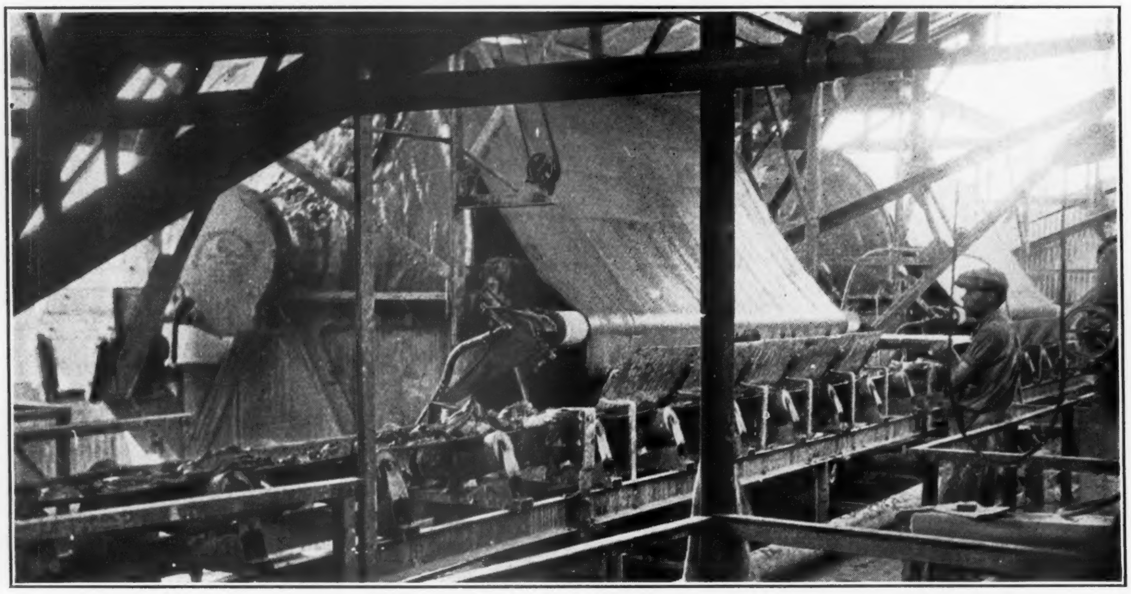
With the moisture in the feed to the kiln cut in half, the coal saving effected closely approximates one-half of the difference in coal required when feeding wet slurry and when feeding bone-dry material. This saving should allow the plants to pay for the filters installed in two years' operation. These savings will be effected if the wet cake feed operates satisfactorily in the kilns. If it tends to ball up, form mud rings and spill back out of the end of the kiln, shutdowns will subtract from these savings.

The true duty of the filters must, then, be more than simple dewatering and include conditioning of the cake so that it can be fed to the kiln without difficulty. This is summed up in the phrase—workable texture of cake—and is another important reason why relatively dry cakes must be obtained.

It is claimed that the success with "FEinc" filters shows the instances of a filter cake containing 19.5% water with one operation and 20.1% with another, and while the difference in moisture is only 0.6%, the actual feel of the cakes shows a difference in texture that is compact and dense on the one hand and sloppy and sticky on the other. It is therefore the aim in all instances to produce a type of cake best fitted to the particular installation.

The explanation of the small area required in "FEinc" filters on cement slurries is the ability to discharge thin cakes. The Filtration Engineers, Inc., explain further that perhaps a strictly technical discussion will be required, but for the majority of cement men the simple statement that doubling the filtering time does not double the capacity of the filter will be sufficient. There are slurries that form a ⅛-in. cake in 20 seconds filtration, and if the filtering be extended to one minute, the cake will be only 3/16-in. thick. Obviously, the ability to discharge a ⅛-in. cake obviates the need of slowing down the filter to accommodate the longer filtering period. The faster the filter rotates the more filter area per hour presented for the repeated cycle of filtration, dewatering, and discharge. Assume in the example above that the ⅛-in. cake weighs 1 lb. (dry weight basis) per square foot, and the 3/16-in. cake weighs 1.5 lb. per square foot. For 20 seconds' filtration let the filter rotate 1 r.p.m. and for the one minute filtration let the filter rotate at ⅓ r.p.m. In an hour's operation the 1 r.p.m. unit makes 60 revolutions, the ⅓ r.p.m. 20 revolutions, and at their respective loading we find that 60x1 gives 60 lb. per hour, while 20x1.5 results in 30 lb. per hour capacity. Therefore to turn out equivalent amounts per hour the slower rotating unit requires double the filter area.

Another question most frequently asked, according to the manufacturers of this filter, is "will the strings discharge the cake and not break all the time?" It is possible that there may be a product that the strings will not lift from the filter cloth or that cannot be combed from the strings; it has not yet been encountered, they say. There are installations on which the string breakage at one time was large, but there were good reasons for this, and when the conditions were changed, string breakage became negligible, it is claimed, and the total yearly cost of strings and cloths is said to be remarkably low. The strings leave the drum at a point of tangency to the drum. This means the strings (with the cake) leave the drum at right angles to the filter cloth. There is



Automatic filter for dewatering of cement slurry in wet-process mills. The filter is of the vacuum drum type; filter cake is removed from the drum by a canvas compress belt driven by contact with the cake as the drum rotates

no "blow back," it is claimed.

It is proposed to make every such filter installation the part purchase of an eventual system to deliver a dry product to the kiln, utilizing the waste gases from kiln or waste-heat boilers for this work. It is quite evident that the conveyance of the cake from the filter in sheet-like form with both surfaces exposed for drying effect requires simply a travel through a dryer chamber with sufficient time in the dryer to drive off the water. Waste gases of 400 deg. F. can be utilized for this work. Most waste-heat boilers and all kilns vent the gases at a higher temperature. Dry-cake kiln feed means a coal saving of the entire difference between wet slurry and dry feed requirements. It makes possible all the advantageous of wet grinding and mixing with the economies of dry feeding and without any increased dust loss or any change in existing kiln installation.

Practically the dried cake discharge proves of even greater advantage. The dried flake-like product is storable, easily conveyed and fed to the kilns with no fear of balling up, mud rings or spill backs. It enables the filters to be operated without reference to kiln operation (single or collectively), and it enables a filter to shut down without affecting the capacity of a kiln.

Combination Loads for Blast Holes

PELLET POWDER consists of blasting powder compressed into perforated cylinders which are wrapped in paper to form cartridges.

In the December, 1928, "Explosives Service Bulletin" of the E. I. du Pont de Nemours and Co., the use of this powder charged to small diameter holes along with dynamite is discussed, with the idea of explaining just why this practice should be discouraged.

Apparently an old practice still survives where a stick of dynamite is placed in a hole, followed by a charge of pellet powder. The powder is exploded by a squib and fuse, and the dynamite by the heat from the powder's detonation. The bulletin points out that owing to the great differences in the rates of detonation of dynamites and pellet powder that either the dynamite breaks down the material by itself and the powder spreads through the openings made by the dynamite, or, if the dynamite charge is too light to do this, it simply shatters the material in its immediate vicinity, leaving the powder to do the work as if there were no dynamite present.

The hazards arising from the use of combination charge are also outlined, the main ones being that the dynamite may fail to explode or the dynamite may simply burn and emit poisonous fumes. The practice also is unsafe, as the tendency is to use straight nitroglycerine dynamites which are more apt to explode under these conditions. The use of this dynamite is also discouraged in underground mining on account of its sensitive characteristics and also on account of the fumes it produces.

Plasticizer and Waterproofing Agent for Cements and Concrete

A NUMBER of interesting properties are claimed for "Aquagel," a product supplied by the Silica Products Co., Kansas City, Mo., for use as an admixture to cements and mortars. According to the makers, cement mortars which include Aquagel in the mix prevents segregation of aggregate thereby lessening the danger of crazing, dusting and hair cracking of the finished concrete work. It is also said to be a strengthening agent for concrete and in many other ways is claimed to be a most useful mineral to incorporate in the usual mix, whether it be in a cement products plant or ready-mixed mortar plant.

Aquagel ground into cement clinker is now on sale as "Plastic King" portland cement and its use is recommended by the makers. The properties of the mineral (it appears to be ground bentonite) are pointed out in an interesting bulletin by the company. In this is also given a number of analyses and tests made for comparison with competitive materials. In all instances the Aquagel appears to have material advantages for the concrete worker.

The data below are taken from this bulletin:

EFFECT OF AQUAGEL ON STRENGTH OF CONCRETE

(Tests made by K. C. Testing Laboratory)

Mix	W-C ratio	Aquagel (lb. per sack)	28-da. crushing strength (lb./sq. in.)
1-2 -3	.4	0	4226
1-2 -3	.5	0	6642
1-2 -3	.6	0	3312
1-2 -3	.7	0	2087
1-2 -3	.6	3	3550
1-2½-4	.6	0	2194
1-2½-4	.6	3	2673
1-2½-4	.6	5 (oiled)	2912
1-2½-4	.5	0	3230
1-2½-4	.5	3	3477
1-2½-4	.5	5 (oiled)	3522
1-2 -3	.6	Diatomite 4.	2802
1-2 -3	.6	Lime 6.	2358

Acquires Oil-Engine Company

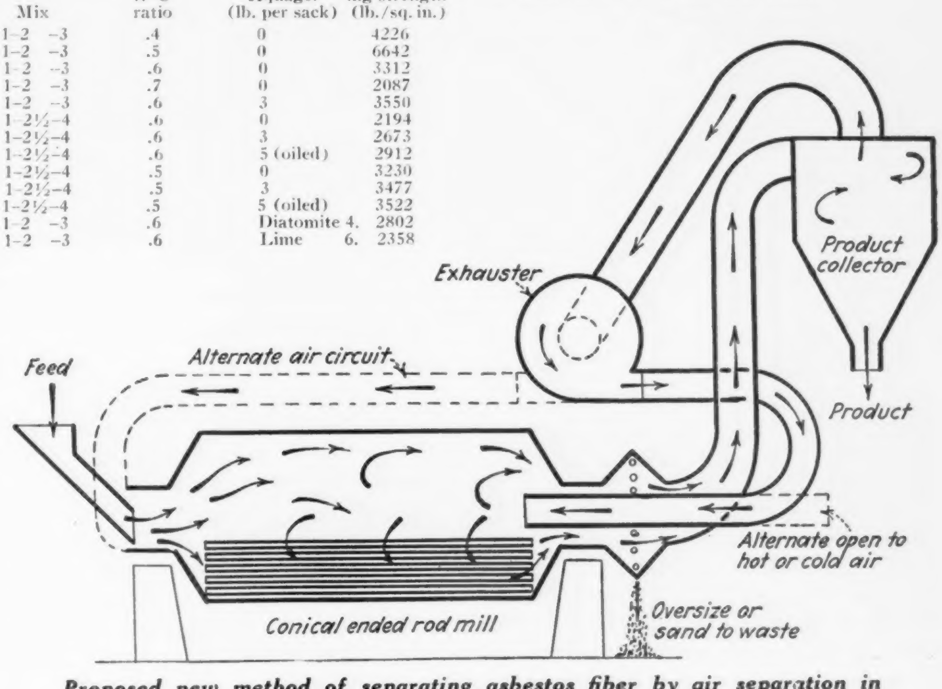
AS A RESULT of the purchase of all outstanding capital stock of the Power Manufacturing Co., Marion, Ohio, the Osgood Co. has acquired all property of the company, including its large manufacturing plant in Marion and real estate and buildings where many district agencies are housed in various parts of the country. The Power Manufacturing Co. has 45 agencies in different sections of the United States and abroad.

Improved Method of Separating Asbestos Fiber from Matrix

HARDINGE CO. is engaged in carrying on a series of interesting experiments in which an improved method of separating asbestos fiber from inclosing matrix or gangue may be devised. The work is being carried on at the company's laboratory at York, Penn., and also in their air separating mills installed at Columbia University laboratory, New York. One of the principal objects is to get as long a fiber as possible.

The proposed method utilizes air separation in combination with previous crushing by the conical ended rod mill. This type of mill is said to be quite adapted for this work owing to the increased acceleration of air through the cone with consequent ability to lift the longer fiber while the crushed gangue is being separated at the outlet. The fiber does not pass through the mill, hence any undue clogging and wear on the blades as well as "punishing" of fiber is obviated.

This method, if successful, may displace older and complicated procedure in separation of the fiber. Further data will be published as soon as other experiments confirm findings already made regarding crushing the material in rod and ball mills.



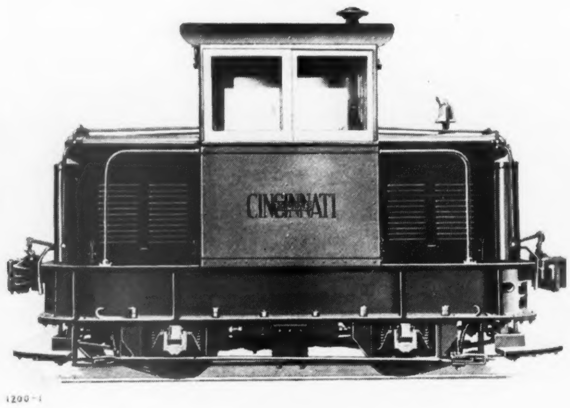
Proposed new method of separating asbestos fiber by air separation in conjunction with conical ended rod mill

New Machinery and Equipment

New Gear-Driven Gasoline Locomotives

THE locomotive division of the Cincinnati Car Corp., Cincinnati, Ohio, announces its new 1200 Series gasoline powered, gear-driven, industrial locomotives embodying improvements in design and construction to bring about both greater simplicity and durability, as well as better performance. These are also reflected in the ease of operation and servicing, and in faster handling and continuous service. Four starting and traveling speeds, both forward and backward, are provided.

A liberal ratio of engine horse-power per ton of locomotive is provided in the rugged, slow-speed engine used in the different models, so that a good drawbar-pull is available in all the different speeds, and at speeds that permit of load being hauled at a good rate, according to the manufacturers.



New gear-driven industrial gasoline locomotive

To insure proper functioning of the engines, they are provided with oil purifier, gasoline strainer, and temperature gauge, the latter being mounted on an instrument panel in the cab with gasoline gauge, oil gauge, ammeter, and the different switches for control of ignition, lights and starting equipment. A spray-pump primer is also provided to assist in starting in cold weather. Large water capacity is provided in an over-sized radiator and the engine, to afford the proper cooling of the engine in hot weather or hot climates.

The clutch connecting the engine and transmission is said to embody advantages of both the dry and oil clutches. Due to its construction, and the fact that it is enclosed in oil, it can be slipped severely, as is often necessary in starting loads, without any appreciable heating, the manufacturers state.

All levers and clutches are handled in a manner quite similar to automobile or motor-truck driving. The car operator can also operate the automatic car-couplers at either end of the locomotive without leaving his seat. Effective hand brakes are provided either with or without air brakes. Air brakes are optional on all models, but can be furnished for operating on the locomotive alone, or the locomotive and cars together. The different models in this series are all built in a variety of sizes and track gages, and adapted for handling either industrial cars or railroad cars.

One-Yard Diesel Drag Shovel

THE NEW 1-YD. Diesel-driven drag shovel announced by Bucyrus-Erie Co. of South Milwaukee, Wis., is a convertible type for use as shovel, dragline, crane or clamshell. Where several different types of this equipment are to be used, the new shovel forms a useful machine with low fuel costs. It is said to require only 15 to 20 gallons per day of Diesel oil at a cost of 4 to 10 cents per gallon depending upon the location.

The machine is built simply and ruggedly. Its boom is of latticed channel construction while the dipper handle is a steel casting of I-beam section. The dipper, built with a heavy arch to take the thrust of boom and dipper handle, is built with long, chisel-shaped reversible teeth held in wedge-shaped sockets without bolts or rivets—teeth easy to replace and resharpen. The dipper is made with a marked flare to make it easier for the operator to cut a smooth wall and to cut the time required for dumping. Both hinged bottom and solid dippers are available in sizes for several trench widths.

With standard 24-ft. boom and 8 ft. 6-in. dipper handles the machine has a rated maximum digging depth of 21 ft. and a digging radius of 36 ft. 6 in. The clear dumping height for a front opening dipper is 10 ft. 3 in. The minimum dumping reach of the same dipper is 19 ft. 6 in. while the solid type dipper dumps between a radius of 17 ft. and 30 ft.

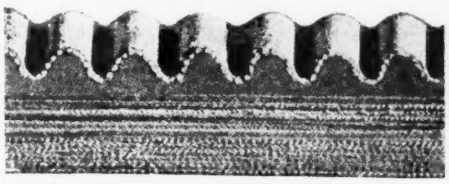
Convertible Diesel-driven 1-yd. drag shovel

Large Gear Generating Machine

A NEW Sykes gear generating machine has recently been built by the Farrel-Birmingham Company, Inc., Buffalo, N. Y., to generate helical spur and herringbone gears of very large pitch. The new machine will generate gears up to 19 ft. dia. with a 54-in. face width and will cut the well-known Sykes continuous herringbone teeth up to 0.75 D.P. and straight gears up to 6 in. C.P. Cutters up to 18-in. pitch diameter are employed.

Cog-Belt Drives

AN improved V-belt drive for driving industrial equipment is announced by the Dayton Rubber Manufacturing Co., Dayton, Ohio. The Dayton cog-belt drive consists of one or more Dayton cog-belts operating in the grooves of a driving and a driven pulley, the number of belts used



Section of cog-belt drive

depending upon the horsepower to be transmitted, the speed and the characteristics of the driven load. Some of the advantages claimed for this drive are:

Minimum Space Required—Small pulleys and extremely short center to center distances possible without the use of idlers.

Positive Speed—Exact speed ratio maintained through greater gripping power.

Rugged—Unaffected by dust or moisture-laden atmospheres.

Smooth Starting and Running—Absorb the shocks of power suddenly applied, through "seating" action of belts in grooves.

Vibration Eliminated — No vibration transmitted between driving and driven machines.

Less Maintenance—Due to long life, belt replacement extremely infrequent. No lubrication necessary. No dressing.

Less Adjustment—Pre-stretched construction and correct mechanical design eliminate necessity of frequent "take-ups."

Quiet—Particularly recommended wherever quietness is essential.

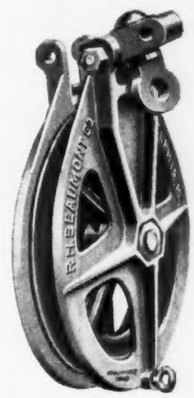
Clean—No oil or grease to leak or collect dust.

Easy on Bearings—Greater gripping power permits less tension.

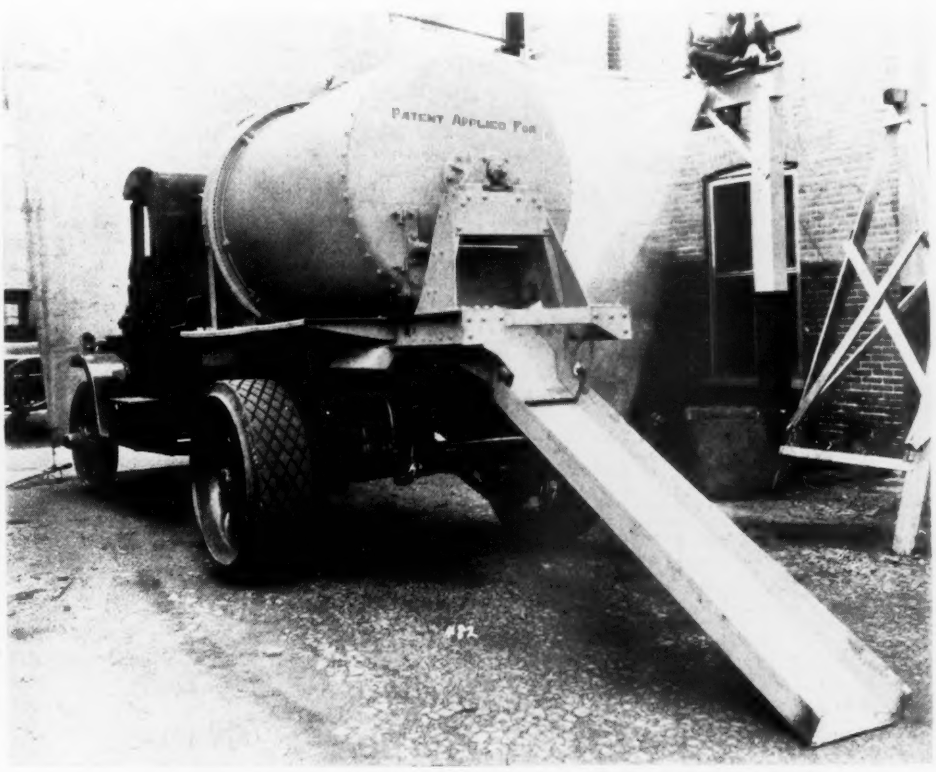
The accompanying illustration shows a section of the V-belt and indicates its construction.

Improved Snatch Block

IMPROVED snatch blocks have been especially designed for use in conjunction with cable drag service by the R. H. Beaumont Co., Philadelphia. The blocks are light in weight and simply constructed with swivel eye and snatch arrangement. The blocks are designed with a fixed bronze bushing, and a steel bushing inside the sheave. The manganese steel side frames are furnished with a lip extending completely around the sheave to prevent the cable from jumping off sheave or jamming between sheave and side frames. All blocks are lubricated by a "Dot" fitting, supplying grease to a reservoir in the hub.



Improved snatch block



New delivery body that can be installed on standard truck chassis interchangeably with regular body for handling ready-mixed concrete

Vertical Capstan Car Puller

LIDGERWOOD MANUFACTURING CO., Elizabeth, N. J., are marketing a new vertical capstan car or barge puller known as the "Tugmore." Compactness has been emphasized in the design, the space requirements being only 25x34 in.

The "Tugmore" has been made a standard type, and is available from stock in five sizes; 5 and 7½ hp. a. c. or d. c. and a 6 to 8 hp. twin-cylinder air-cooled motor using gasoline or kerosene for fuel. Adaption of the air-cooled motor to drive the capstan has eliminated the freezing hazard. Three types of anti-friction bearings, running in oil, are used in the "Tugmore" and electric and gasoline types are of weathertight construction.

Vertical type capstan car puller

Delivery Body for Concrete

THE Portland Concrete Machines Co., Chicago, Ill., is introducing a new delivery body, for handling ready-mixed concrete, which has a number of new and novel features. The tank is designed to be installed on any standard truck chassis of sufficient length and load capacity. It is a complete body unit and can be used interchangeably with other bodies, or can be mounted on a new or old chassis. The tank is made in 2,- 3,- 4- and 5-cu. yd. sizes.

The wet mix is delivered into the top of the tank and discharged through a door at the rear and bottom. The contents are hermetically sealed in the tank during delivery, and completely protected against weather conditions or stiffening or hardening. This is accomplished by rotating the tank at a speed of 3 to 9 r.p.m. through adjustment of a special engine governor. This rotation is controlled by a separate power plant attached at the front end.

The interior of the tank is provided with vanes set longitudinally and offset from the shell. These direct the flow of material to the front end of the tank, and, together with the rotation, keep the mass in a state of even consistency. By this means concrete may be delivered, it is claimed, two or three hours away.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.75	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.	....	1.30	1.10	1.00	1.00	....
Frederick, Md.	.50–.75	1.35–1.45	1.15–1.25	1.10–1.20	1.05–1.15	1.05–1.10
Ft. Springs, W. Va.	.40	1.35	1.35	1.30	1.25	1.15
Munns, N. Y.	.75	1.25	1.25	1.15	....	....
Prospect, N. Y.	.80	1.15	1.15	1.15	1.15	....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.65	1.25	1.05	.95	.90	1.00
Syracuse, N. Y.	.50	1.00	1.00	1.00	1.00	1.00
Walford, Penn.	....	....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	....	....	....	.50	....	1.50
Alton, Ill.	....	....	1.85	....	....	....
Columbia and Krause, Ill.	1.05–1.40	.95–1.50	1.15–1.50	1.05–1.50	1.05–1.50	....
Cypress, Ill.	1.60	1.00	1.10	1.00	1.00	1.25
Davenport, Iowa (f)	1.00	1.50	1.50	1.30	1.30	1.40
Dubuque, Iowa	.95	1.00	1.00	1.10	1.10	1.00
Stolle and Falling Springs, Ill.	1.05–1.70	.95–1.70	1.15–1.70	1.05 1.70	1.05–1.70	....
Greencastle, Ind.	1.25	1.10	1.10	1.10	1.10	1.10
Lannon, Wis.	1.00	1.00	1.00	.90	.90	.90
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	....	.90–1.00	1.00–1.10	.90–1.00	.85– .90	.85– .90
Northern Ohio points	.85–1.15	1.25	1.15	1.15	1.15	1.15
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Stone City, Iowa	.75	....	1.10	1.05	1.00	....
Thornton, Ill.	.90	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	1.10	1.70	1.70	1.70	1.70	1.70
Toronto, Canada	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90–1.20	....	....	1.75	....	1.75
Waukesha, Wis.	....	.90	.90	.90	.90	....
Winona, Minn.	1.00	1.20	1.30	1.40	1.40	1.40
Wisconsin points	.50	....	1.00	.90	.90	....
Youngstown, Ohio	1.00	1.00	1.25	1.25	1.25	1.25
SOUTHERN:						
Cartersville, Ga.	1.00	1.65	1.65	1.35	1.15	1.15
Chico, Texas	.50	.50	1.25	1.15	1.10	1.00
Cutler, Fla.	.50– .75r	....	....	1.75r	1.10r	....
El Paso, Texas	.50r	1.00–1.50	1.00–1.50	1.00	1.00	.75
Graystone, Ala.	Crusher run, screened, $1 per ton					
Olive Hill, Ky.	1.00	1.00	1.00	.90	.90	.90
Rocky Point, Va.	.50– .75	1.40–1.60	1.30–1.40	1.15–1.25	1.10–1.20	1.00–1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.00	1.25	1.25	1.25	1.00	....
Rock Hill, St. Louis, Mo.	1.45	1.45	1.45	1.45	1.45	1.45

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.75	1.50	1.35	1.35
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	....
Northern New Jersey	1.35–1.40	1.80–2.10	1.80–1.90	1.50–1.60	1.50–1.60	....
Richmond, Calif.	.75	....	1.00	1.00	1.00	....
Spring Valley, Calif.	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25
Springfield, N. J.	1.40	2.00	1.90	1.60	1.60	....
Toronto, Canada	....	5.80	....	4.05	....	....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	....
Cayce, S. C.—Granite	....	....	1.75	1.75	1.60	....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	....	....	2.25–2.50s	....	....	....
Lithonia, Ga.—Granite	.50a	1.75b	1.60	1.35	1.25	....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	....
Middlebrook, Mo.	3.00–3.50	....	2.00–2.25	2.00–2.25	....	1.25–3.00
Richmond, Calif.—Quartzite	.75	....	1.00	1.00	1.00	....
Somerset, Penn. (sand-rock)			1.50 to 1.85			
Toccoa, Ga.—Granite	1.40	1.40	....	1.30	1.30	1.30

(a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) High calcite fluxing limestone, 92–98% CaCO, 1.75. (g) Run of quarry. (h) Less 10c discount. (j) Less 10% net ton. (k) Rubble stone. (l) Less .05. (n) Ballast R. R., .90; run of crusher, 1.00. (p) Carload prices. (q) Crusher run, 1.40; ¼-in. granolithic finish, 3.00. (r) Cubic yard. (s) 1-in. and less, per cubic yard.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$; 100% thru 4 mesh	1.85
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	**1.50**
Blackwater, Mo.—100% thru 4 mesh	**1.00**
Branchton, Penn.—100% thru 20 mesh, 60% thru 100 mesh, 45% thru 200 mesh	a5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh	**1.50**
Cartersville, Ga.—90% thru 100 mesh, 2.00; 50% thru 50 mesh	1.50
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	**2.50**
Cypress, Ill.—Analysis, 94-98% $CaCO_3$, **2% $MgCO_3$; 90% thru 100 mesh, 1.35; 50% thru 100 mesh, 1.15; 90% thru 50 mesh, 1.15; 50% thru 50 mesh, 1.05; 90% thru 4 mesh, 1.10; 50% thru 4 mesh**	**1.00**
Danbury, Conn., and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$; 5% $MgCO_3$; fine ground, 90% thru 100 mesh; bulk	**3.50**
Paper bags	**4.75**
100-lb. cloth bags	**5.25**
(All prices less .25 cash 15 days)	
Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 200 mesh, bags, per ton	**6.00**
90% thru 20 mesh, bulk, per ton	**1.50**
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	**5 00**
Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags	**3.95**
Bulk	**2.70**
Jamesville, N. Y.—Analysis, 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk	**2.75**
Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 90% thru 100 mesh	**3.50**
Knoxville, Tenn.—80% thru 100 mesh; bags, 3.75; bulk	2.50
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk	**1.75**
Marl — Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk	**2.25**
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	**2.00**
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.25
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	**1.35–1.60**
Olive Hill, Ky.—Analysis, $CaCO_3$ 94-98%; 50% & 90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 101.12%; 60% thru 100 mesh	2.50
100% thru 10, 90% thru 50, 70% thru 100; bags, 5.00; bulk	**3.50**
100% thru 4, 30% thru 100, bulk	**1.50**
Rocky Point, Va. — Analysis, $CaCO_3$, 97%; $MgCO_3$, 75%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	**2.00**
Watertown, N. Y. — Analysis, 53.72% $CaCO_3$; pulverized; sacks, 4.25; bulk	**2.75**

(a) Less 50c comm. per ton.

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98% $CaCO_3$; 1%, $MgCO_3$; 90% thru 10 mesh	**1.50**
30% thru 100 mesh	**1.50**

(Continued on next page)

Agricultural Limestone

Chico and Bridgeport, Tex.—Analysis, 95% $CaCO_3$; 1.3% $MgCO_3$; 90% thru 4 mesh	1.00–1.25
Charles-Town, W. Va.—Lime Marl—Analysis, 95% $CaCO_3$, 50% thru 100 mesh, bulk, 3.00; including burlap bags	4.50
Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 10 mesh, per ton	1.25
90% thru 4 mesh, per ton	1.10
Dubuque, Iowa—Analysis, 54% $CaCO_3$; 38% $MgCO_3$; 90% thru 50 mesh	.95
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Ft. Spring, W. Va.—Analysis, 90% $CaCO_3$; 4% $MgCO_3$; 50% thru 100 mesh	1.50
Kansas City, Mo.—50% thru 100 mesh	1.00
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio—90% thru 100 mesh	3.00
90% thru 50 mesh	2.00
90% thru 4 mesh	1.00
McCook, Ill.—90% thru 4 mesh	.95
Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Kokomo, Ind.—85% thru 10 mesh, 25% thru 100 mesh	1.50
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Mountville, Va.—Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags	5.00
Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh	1.15–1.70
Stone City, Iowa—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Waukesha, Wis.—90% thru 100 mesh, 4.00–7.00; 50% thru 100 mesh	2.10
Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	1.10–1.70

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; paper sacks	6.00
Hillsville, Penn., sacks, 5.10; bulk	3.50
Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 95% thru 100 mesh; paper bags (bags extra)	3.50
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks	4.25
Piqua, Ohio—99% thru 100 mesh, bulk, 3.50; in 80-lb. bags (f.o.b. Piqua)	5.00
Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk	2.25–3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.00

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J.	*1.75–2.25
Cheshire, Mass., in carload lots	5.00–7.00
Estill Springs and Sewanee, Tenn.	1.50
Franklin, Penn.	2.00
Klondike, Mo.	2.00
Massillon, Ohio	3.00
Michigan City, Ind.	.30– .35
Ohlton, Ohio	2.50
Ottawa, Ill.	1.25
Red Wing, Minn.	1.50
San Francisco, Calif.	4.00–5.00
Silica and Mendota, Va.	2.00
St. Louis, Mo.	2.00
Utica and Ottawa, Ill.	.75–1.00
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.50
Dresden, Ohio		1.25
Eau Claire, Wis.	4.30	1.00–1.25
Estill Springs and Sewanee, Tenn.	1.35–1.50	1.35–1.50
Franklin, Penn.		1.75
Massillon, Ohio		2.00
Michigan City, Ind.		.30
Montoursville, Penn.		1.25
Ohlton, Ohio	1.75	1.75
Ottawa, Ill.	1.25	1.25
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.		1.75

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N. J.	.50	.50	1.15	1.25	1.25	
Attica and Franklinville, N. Y.	.65	.65	.75	.65	.65	.65
Boston, Mass.†	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05	1.05	1.05
Erie, Penn.	.70	.90		1.30		
Leeds Junction, Me.		.50	1.75		1.25	1.00
Machias Jct., N. Y.	.75	.75	.75		.75	.75
Milton, N. H.		.50				.90
Montoursville, Penn.	1.00	.75	.80	.75	.70	.70
Northern New Jersey	.40– .50	.40– .50	1.00–1.25	1.00–1.25	1.00–1.25	
Somerset, Penn.		2.00				
South Portland, Me.		1.00	2.25			2.00
Troy, N. Y.	.50– .75*	.50– .75*	.80–1.00*	.80–1.00*		.80–1.00*
F. o. b. boat, per yd.	1.50	1.50	1.75	1.75		1.75
Washington, D. C.	.55	.55	1.20	1.20	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.50	.35	.25	.45	.45	.50
Appleton, Minn.		.50	1.25		1.50	
Attica, Ind.	All sizes .75–.85					
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.50	.35	.20	.50	.60	.60
Barton, Wis.		.40s	.50s	.65s	.65s	.65s
Chicago, Ill.	.50	.50–1.45n	.60	.60–1.55n	.60	.60–1.90n
Chicago, Ill.	.30	.20	.30	.40	.40	.45
Columbus, Ohio		.75‖	.75‖	.75‖	.75‖	
Des Moines, Iowa		.60	1.50	1.50	1.50	1.50
Eau Claire, Chippewa Falls, Wis.	.40	.40	.55	.85	.85	
Elkhart Lake, Wis.	.40	.30	.45	.50	.50	.50
Ferrysburg, Mich.		.50– .80	.60–1.00	.60–1.00		.50–1.25
Grand Haven, Mich.		.60		.90		.90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio		.85	.85		.85	
Hersey, Mich.		.50		.50	.70	.70
Humboldt, Iowa	.50	.50	1.40	1.40	1.40	1.40
Indianapolis, Ind.	.50– .75	.40– .60	.50– .75	.50– .75	.60– .85	.60– .85
Mankato, Minn.	.55	.45	1.25		1.25h	
Mason City, Iowa		.60	.85	1.25	1.25	1.25
Mattoon, Ill.	.75–.85 all sizes					
Milwaukee, Wis.	.91	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn. (g)	.35	.35	1.25	1.35	1.35	1.25
St. Louis, Mo. (b)	1.30e	1.30f	1.55t	1.55	1.55	1.65
St. Louis, Mo.†	2.00e	2.00f	2.25t	2.25	2.25	2.35
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.60	.75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.10	1.10	1.25
SOUTHERN:						
Brewster, Fla.	.50	.50				
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.	River sand and gravel, all sizes, 1.40					
Eustis, Fla.		.50				
Fort Worth, Texas	.75–1.00	.75–1.00	1.00–1.10	1.00–1.25	1.00–1.25	
Knoxville, Tenn.	1.00	1.00	1.50	1.20	1.20	1.20
Macon, Ga.	.65– .90	.65– .90	2.25–2.50	2.25–2.50	2.25–2.50	2.25–2.50
New Martinsville, W. Va.	1.10	1.00		1.30	1.10	.90
Roseland, La.	.30	.30	1.00	1.00	.80	.80
WESTERN:						
Kansas City, Mo.	.70– .80	.70– .75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10– .40	.10– .40	.50–1.00	.50–1.00	.50–1.00	.50–1.00
Los Angeles, Calif.	.30	.30	.80	.80	.80	.80
Oregon City, Ore.	All grades range from 1.00 to 1.25 per cu. yd.					
Otay, Calif.		.35– .40	.50– .60	.50– .60	.50– .60	.50– .60
Phoenix, Ariz. (k)	1.25*	1.15*	1.50*	1.15*	1.15*	1.00*
Pueblo, Colo.	.70	.60		1.25		1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			.40			
Appleton, Minn.	.55					
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.35
Burnside, Conn.		.75*				
Chicago, Ill.	1.25m			.35		
Des Moines, Iowa		.75				
Dresden, Ohio				.70	.65	
Eau Claire, Chippewa Falls, Wis.					.65	
Fort Worth, Texas						.60
Gainesville, Tex.					.55	
Grand Rapids, Mich.				.50		
Hamilton, Ohio					.70	
Hersey, Mich.				.50		
Indianapolis, Ind.	Mixed gravel for concrete work, at .65					
Macon, Ga.	.35					
Mankato, Minn.	.70					
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Roseland, La.				.60	.60	.60
Somerset, Penn.		1.85–2.00		1.50–1.75		
Steilacoom, Wash.	.25					
St. Louis, Mo.	Mine run gravel, 1.55 per ton					
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.						.60
York, Penn.	1.10	1.00				

*Cubic yd. †Delivered on job by truck. (a) ⅝-in. down. (b) 1½- to ¼-in., 1.65. (c) 2½-in. and less. ‖By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramec River. (g) Per yd., del. by truck, ¼-in. down, 1.25; 2 in. and less, 2.40. (h) ¾-in. and larger. (j) Lake sand, 1.75, delivered. (k) 60–70% crushed boulders. (m) Cu. yd., dune sand, f.o.b. cars, Chicago. (n) Cu. yd., f.o.b. cars, Chicago. (r) Pit run. (s) Plus 15c for winter loading. (t) Fine and regular binder. (u) Coarse, torpedo, also roofing. (v) Coarse binder. †2% discount if paid by 15th of month following delivery.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.00	2.00	2.25			3.75	3.00
Beach City, Ohio	1.75	1.75		1.50	1.50		
Cheshire, Mass.	Sand for soap, 7.00–8.00					6.00–8.00	
Dresden, Ohio	1.25–1.50	1.25–1.50	1.50–1.75	1.00 1.25			
Eau Claire, Wis.						3.00	
Elco and Murphysboro, Ill.	Water-floated ground silica per ton in carloads—18.00–31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35–1.50	
Franklin, Penn.	1.75	1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.10–1.50	1.25–2.00	2.00			2.75–3.00	
Klondike, Mo.	2.00			2.00			
Massillon, Ohio	2.25	2.25		2.25	2.50		
Michigan City, Ind.				.30– .35			
Montoursville, Penn.				1.50–1.60			
New Lexington, Ohio	2.00	1.50					
Ohlton, Ohio	1.75	1.75		2.00	1.75	1.75	
Ottawa, Ill.	1.25–3.25	2.25	1.25–3.25	1.25–3.25	1.25	3.50	3.00
Red Wing, Minn. (d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50–5.00†	3.50–5.00†	3.50–5.00†	
Silica, Mendota, Va.	Potters sand, 8.00–10.00g						1.75
Utica and Ottawa, Ill.	.40–1.00f	.40–1.00f	.75–1.00	.40–1.00f	.60–1.00f	2.23–3.25	1.00–3.25
Utica, Ill.	.60	.70		.75	1.00		
Warwick, Ohio	1.50*–2.00h	1.50*–2.00h		1.50*–2.00h			
Zanesville, Ohio	2.00	1.50	2.00	2.50	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (d) Filter sand, 3.00. (e) Filter sand, 3.00–4.25. (f) Crude and dry. (g) Also 12.00; building sand, 1.75–2.00. (h) Washed, 1.75.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Du Bois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.25		1.50			
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio		1.30*		1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	1.30*
Toledo, Ohio	1.50	1.10	1.25	1.25	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.	2.05*	1.45*	1.80*	1.45*	1.45*	1.45*	1.45*
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05	.55*		1.15*	.90*	.90*	

5c per ton discount on terms. †1¼ in. to ¼ in., $1.05; ⅝ in. to 10 mesh, $1.25*; ⅝ in. to 0 in., .90*; ¼ in. to 10 mesh, .80*.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[10]
Lime Ridge, Penn.							5.00	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[12]
Williamsport, Penn.	10.00–11.00	8.50–9.00	8.50–9.00		7.00	9.00	5.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50–9.50[7]	8.50–9.50[7]	8.50–10.50[7]	8.00	9.25	7.00	1.40[5]
CENTRAL:								
Afton, Mich.						10.75	7.50	12.11
Carey, Ohio	11.50	7.50	7.50		8.00		7.50	1.50
Cold Springs, Ohio		7.50	7.50				8.00	
Gibsonburg, Ohio	11.50	7.50	7.50		8.00	10.00	8.00	
Huntington, Ind.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[10]
Luckey, Ohio	11.50							
Milltown, Ind.		8.50–10.00		10.00[8]			8.50[22]	1.35[10]
Ohio points	11.50	7.50	7.50	12.00	8.00	11.00[23]	7.50	1.50[10]
Scioto, Ohio	10.50	7.50	7.50	8.50	8.00	.62½	7.00	1.50
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	7.50	7.50	12.50	8.00	10.00[9]	8.00	1.50[9]
SOUTHERN:								
El Paso, Texas							7.00	1.50
Frederick, Md.		8.00–9.50	8.00–9.50			9.50[15]	7.00[16]	
Graystone & Landmark, Ala.	12.50	9.00		12.50	8.50		7.50	1.35
Keystone, Ala.		9.00	8.00	9.00	9.00	11.00	7.50	1.35
Knoxville, Tenn.		9.00	9.00	9.00	7.50	.62½	7.50	1.35
Ocala and Kendrick, Fla.		11.00		12.00				
WESTERN:								
Kirtland, N. M.							10.00	
Los Angeles, Calif.	15.00	14.00	12.00	18.00			13.50	
San Francisco, Calif.	19.00–19.50	15.00–17.50	13.00	17.00–19.00	14.50[20]	.90[17]	14.50[19]	1.85[17]
Tehachapi, Calif.[13]	10.80		6.75[11]	12.00			10.30	
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel; in bbl. .95. [5] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] In bags. [11] Refuse or air slack, 10.00–12.00. [12] To 3.00. [13] Delivered in Southern California. [15] To 8.00. [16] To 1.70. [17] Less credit for return of empties. [18] 90-lb. sacks. [19] To mortar plant and large industrials, 13.00. [20] Also 13.00. [22] To 9.00 [23] Per bbl., 2.15. [30] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Utica and Ottawa, Ill.	1.00–3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:	
Crude talc, per ton	5.00–10.00
Ground talc (20-50 mesh), bags	7.00– 9.00
Ground talc (150-200 mesh), bags	10.00–12.00
Pencils and steel crayons, gross	1.50– 3.00
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags (bags extra)	8.00– 8.50
Same, including 50-lb. bags	9.00– 9.50
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Clifton, Va.:	
Crude talc, per ton	4.00
Ground talc (150-200 mesh), in bags	12.00
Conowingo, Md.:	
Crude talc, bulk	4.00
Ground talc (150-200 mesh), in bags	14.00
Cubes, blanks, per lb.	.10
Dalton, Ga.:	
Crude talc (for grinding)	4.00
Ground talc (150-200 mesh), bags	9.00
Pencils and steel worker's crayons, per gross	1.00– 2.00
Emeryville, N. Y.:	
(Double air floated) including bags:	
200 mesh	13.75
325 mesh	14.75
Hailesboro, N. Y.:	
Ground talc (300-350 mesh) in 200-lb. bags	15.50–20.00
Henry, Va.:	
Crude (mine run)	3.50– 4.00
Ground talc (150-200 mesh), bags	6.25–10.50
Joliet, Ill.:	
Ground talc (200 mesh) in bags:	
California white	30.00
Southern white	20.00
Illinois talc	10.00
Crude talc	3.75
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00–30.00
Los Angeles, Calif.:	
Ground (200 mesh), in bags	14.00 25.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), bags	12.00–15.00

(a) Bags extra.

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Columbia, Tenn.—B.P.L. 65-70%	3.50– 4.50
Gordonsburg, Tenn.—B.P.L. 68-70%	4.00– 4.50
Mt. Pleasant, Tenn.—B.P.L., 77%	6.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00– 9.00

Ground Rock

(2000 lb.)

Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 68%	3.50
B.P.L. 72%	4.50
Mt. Pleasant, Tenn.—Lime phosphate:	
B.P.L., 72.50%, 80% thru 300 mesh	11.70
B.P.L. 72%	5.50– 6.00
Twomey, Tenn.—B.P.L. 65%	8.00
Wales, Tenn.—B.P.L. 65%	11.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida—F.o.b. mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

New York City, N. Y.—Per lb.,	
Cut mica (1½x2)	1.60
Cut mica (8x10)	26.00
Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.96
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00
Clean shop scrap	27.00
Mine scrap	20.00
Roofing mica	38.00
Punch mica, per lb.	.05– .12
Trimmed mica; 50% disc. from list, per ton, 20 mesh, 32.50; 40 mesh, 38.00; 60 mesh, 40.00; 100 mesh, 60.00; 200 mesh	70.00

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream, and American Botticino, coral pink, pearl blush	¶12.50–‖14.50	¶12.50–‖14.50
Brighton, Tenn.—Pink marble chips	§3.00	§3.00
Crown Point, N. Y.—Mica Spar	....	¶9.00–‖12.00
Davenport, Ia.—White limestone, in bags	6.00	6.00
Easton, Penn.—Royal green	16.00–18.00a	....
Harrisonburg, Va. — Bulk marble (crushed, in bags)	12.50–14.00	12.50–14.00
Ingomar, Ohio — Concrete facings and stucco dash	....	11.00–18.00
Middlebrook, Mo.—Red	....	20.00–25.00
Middlebury, Vt. — Middlebury white	....	‖9.00–¶10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags	....	5.50
Phillipsburg, N. J.—Royal green granite	....	18.00–20.00
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Stockton, Calif.—"Nat-rock" roofing grits	....	12.00–20.00
Tuckahoe, N. Y.—Tuckahoe white	8.00	....
Warren, N. H.	....	¶8.50
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00
Whitestone, Ga.	b5.00	....

†C.L.; L.C.L. 16.00. ¶C.L. ‖L.C.L. (a) Including bags. (b) In burlap bags, 2.00 per ton extra. *Per 100 lb.

Potash Feldspar

Auburn and Topsham, Me.—Color white, 98% thru 140-mesh	19.00
DeKalb Jct., N. Y.—Color, white; analysis, K_2O, 2.11%; Na_2O, 6.86%; SiO_2, 74.04%; Fe_2O_3, .063%; Al_2O_3, 14.59%; pulverized, 100% thru 200 mesh, soda spar, in bags, per ton, 22.00, bulk 20.00; 100% thru 140 mesh, in bags, per ton, 20.00; bulk	18.00
Bedford Hills, N. Y.—Color, white; analysis, K_2O, 12.26%; Na_2O, 2.86%; SiO_2, 66.05%; Fe_2O_3, .08%; Al_2O_3, 18.89%; pulverized 78% thru 100 mesh, bulk, 11.00–14.00; crude, bulk, per ton	9.00
Trenton, N. J.—White; analysis, K_2O, 11%-13%; Na_2O, 1.5%-2.70%; SiO_2, 63%-67.80%; Fe_2O_3, .09%; Al_2O_3, 18.25%-20%; pulverized, 99.5% thru 200 mesh	20.00
Erwin, Tenn., and Spruce Pine, N. C.	16.00
Rochester, N. Y.	22.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50–14.00; bulk	11.00–12.50
Pulverized, 95% thru 200 mesh; bags, 19.73–23.50; bulk	15.75–22.50
Pulverized, 20% thru 80 mesh; bags, 17.60; bulk	16.50
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; pulverized, bulk	18.00
(Bags 15c extra.)	
Tennessee Mills—Color, white; analysis, K_2O, 10%; Na_2O_3, 3%; SiO_2, 68%; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00

Chicken Grits

Afton, Mich.—(Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per sack	1.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass.—(Limestone)	‡7.50–*9.00
Davenport, Ia.—(Limestone), bags, per ton	6.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—Per ton, including sacks:	
Feldspar	14.00
Gypsum	7.50– 9.50
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton (a)	10.00
Piqua, O. (b)—(Pearl Grit), fine and medium, per ton	¶8.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	7.00
Wisconsin Points—(Limestone), per ton	15.00
Winona, Minn.—(Limestone), sacked, per ton, 8.00; bulk, per ton	6.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags.

(a) F.o.b. Middlebury, Vt. (b) F.o.b. Piqua, Ohio.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	11.00
Barton, Wis.	10.50g
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Dayton, Ohio	12.50–13.50
Detroit, Mich. (h)	j13.00–16.00*d
Farmington, Conn.	13.00
Flint, Mich.	18.00†
Grand Rapids, Mich.	12.50
Hartford, Conn.	13.00–17.00*
Jackson, Mich.	13.00
Lakeland, Fla.	10.00–11.00
Lake Helen, Fla.	9.00–12.00
Lancaster, N. Y.	12.50
Madison, Wis.	12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	12.50
Portage, Wis.	15.00
Prairie du Chien, Wis.	18.00–22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.50
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
South St. Paul, Minn.	9.00
Syracuse, N. Y.	18.00–20.00
Toronto, Canada (f)	15.00†e
Wilkinson, Fla.	12.00–16.00
Winnipeg, Canada	15.00

Delivered on job. †5% disc. 10 days. ‖Dealers' price. (a) Less 50c disc. per M, 10th of month. (d) 5% disc., 10th of month. (e) Delivered. (f) In yard, 12.50; also 12.25. (g) Delivered Milwaukee, 13.00. (h) Also 15.50. (j) Also 14.00.

Portland Cement

	Per Bag	Per Bbl.	High Early Strength
Atlanta, Ga.	....	2.26	3.51¶
Baltimore, Md.	....	2.25–2.65	3.55¶
Birmingham, Ala.	....	1.90	3.44¶
Boston, Mass. (g)	.57e	1.88–2.28	3.27¶
Buffalo, N. Y.	.62½	2.10†	3.40¶
Butte, Mont.	.90¼	3.61	......
Cedar Rapids, Iowa	....	2.24	......
Charleston, S. C.	....	2.25–2.55d	3.58¶
Cheyenne, Wyo.	.64	2.56	......
Chicago, Ill.	....	2.05–2.45	3.35¶
Cincinnati, Ohio	....	2.17–2.57	3.52¶
Cleveland, Ohio	....	2.14–2.64	3.54¶
Columbus, Ohio	....	2.22–2.62	3.52¶
Dallas, Texas	....	1.80	3.39¶
Davenport, Iowa	....	2.24	......
Dayton, Ohio	....	2.21–2.61	3.54¶
Denver, Colo.	.63¾	2.55	......
Des Moines, Iowa	....	2.14	......
Detroit, Mich.	....	1.95–2.35	3.27¶
Duluth, Minn.	....	2.04	......
Houston, Texas	....	1.90	3.63¶
Indianapolis, Ind.	.54¾	2.09–2.49	3.39¶
Jackson, Miss.	....	1.94–2.34	3.53¶
Jacksonville, Fla.	....	2.51b	3.79¶
Jersey City, N. J.	....	2.13–2.53	3.43¶
Kansas City, Mo.	.45½	1.82	3.22¶
Los Angeles, Calif.	.51½	2.06	......
Louisville, Ky.	.55½	2.47	3.47¶
Memphis, Tenn.	....	1.94–2.34	3.34¶
Milwaukee, Wis.	....	2.20–2.60	3.50¶
Minneapolis, Minn.	....	2.12–2.22	......
Montreal, Que.	....	1.60	......
New Orleans, La.	.45½	1.82	3.77¶
New York, N. Y.	.60¾	1.93–2.43	3.33¶
Norfolk, Va.	....	1.97	3.27¶
Oklahoma City, Okla.	.57¼	2.29	3.69¶
Omaha, Neb.	.54	2.16	3.56¶
Peoria, Ill.	....	2.22	......
Pittsburgh, Penn.	....	2.05–2.44	3.35¶
Philadelphia, Penn.	....	2.15	......
Phoenix, Ariz.	....	3.91*	......
Portland, Ore.‡	....	2.40–2.90a	......
Reno, Nev.‡	....	2.91–3.41a	......
Richmond, Va.	....	2.32–2.72	3.62¶
Salt Lake City, Utah	.70¼	2.81	......
San Francisco, Calif.‡	....	2.21–2.71a	......
Savannah, Ga.	....	2.51c	3.65¶
St. Louis, Mo.	.48¼	1.95–2.35	f3.25¶
St. Paul, Minn.	....	2.12–2.22	......
Seattle, Wash.	....	†2.50–2.65j	f3.50†
Tampa, Fla.	....	2.40	4.08¶
Toledo, Ohio	....	2.20–2.60	3.50¶
Topeka, Kans.	.50¼	2.01	3.41¶
Tulsa, Okla.	.53¼	2.13	3.53¶
Wheeling, W. Va.	....	2.12–2.52	3.42¶
Winston-Salem, N. C.	....	2.19–2.59	3.59¶

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.	High Early Strength
Albany, N. Y.	.43¾	1.75	......
Bellingham, Wash.	....	2.10	......
Buffington, Ind.	....	1.80	......
Chattanooga, Tenn.	....	2.45*	......
Concrete, Wash.	....	2.35	......
Davenport, Calif.	....	2.05	......
Hannibal, Mo.	....	1.90	......
Hudson, N. Y.	....	1.75	......
Leeds, Ala.	....	1.65	......
Lime and Oswego, Ore.	....	2.50‡	......
Mildred, Kan.	....	2.35	......
Nazareth, Penn.	....	2.15	......
Northampton, Penn.	....	1.75	......
Richard City, Tenn.	....	2.05	......
Steelton, Minn.	....	1.85	......
Toledo, Ohio	....	2.20	......
Universal, Penn.	....	1.80	......

NOTE—Add 40c per bbl. for bags. *Includes sacks. †10c disc., 10 days. ‡10c disc., 15 days. (a) Includes cloth sacks returnable at 10c each. (b) 15c bbl. refund for paid freight bill. (c) 26c bbl. refund for paid freight bill. (d) 30c bbl. refund for paid freight bill. (e) Paid freight bill taken as part payment of invoice. (f) "Velo" cement, including cost of paper bag. ¶ "Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c disc. 15 days. (g) Also 2.33 per bbl. (j) 25c bbl. disc. 10 days.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Blue Rapids, Kan.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Delawanna, N. J.	....	....	....	4.50–5.00	13.10–14.00	5.00	....	7.25	....	....	....	....	25.00
East St. Louis, Ill.	Special Gypsum Products—Interior partition section, 4 in. wide, 12 in. thick and up to 10 ft. 6 in. long, per ton, 21.00; 6x6 in. and up to 10 ft. 6 in. long, per ton, 30.00; floor section, 7x16 in. and up to 13 ft. 6 in. long, per ton, 23.00.												
Ft. Dodge, Iowa; N. Holston, Va.; Akron, N. Y.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Grand Rapids, Mich.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Gypsum, Ohio	1.70–3.00	4.00	6.00	7.00–9.00	9.00	9.00	19.00	7.00	24.50	19.00	....	15.00	20.00–25.00
Los Angeles, Calif. (f)	3.50–5.00	6.00–8.00	6.00–8.00	7.50–8.50	7.50–10.00	....	8.00–10.00	....	26.90	....	....	....	....
Medicine Lodge, Kan.	....	....	....	....	....	....	....	....	15.00	....	....	....	....
Oakfield, N. Y.	2.50	....	....	5.50	6.00	6.00	....	5.50	....	....	....	15.00	25.00
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	....	20.00	30.00
Providence, R. I. (x)	....	....	....	12.00–13.00o	....	....	....	....	....	....	Partition block, solid reinforced, 12x30x3", 7c per sq. ft. in truck lots		
San Francisco, Calif.	....	....	9.00	13.40	14.40	....	15.40	....	....	....	....	....	....
Seattle, Wash.	....	....	10.50m	12.00m	13.00	....	14.00	....	....	....	....	....	....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	....	....	....	....	20.00w	....	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable. (a) Hardwall plaster, 13.00; casting, finishing molding, 14.00; (b) Calacoustic plaster, 10.00 at mill; (c) Plaster lath; (d) ¼x48x36 in.; (f) plasterboard, 18c to 20c per yd.; (m) includes paper bags; (o) includes jute sacks; (u) includes sacks; (v) retail, 35.00; (w) 16x48; (x) 2- and 3-in. "Fabricaste" gypsum blocks, 6-7c per sq. ft.

Market Prices of Cement Products and Slate

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

City or shipping point	Size 8x8x16
Camden, N. J.	16.50
Cement City, Mich.	55.00¶
Chicago District‖	180.00–210.00a
8x10x16	230.00–260.00a
8x12x16	280.00–330.00a
Columbus, Ohio	15.00c– 17.00†
Detroit, Mich. (d)	.15– .17†
Forest Park, Ill.	21.00*
Grand Rapids, Mich.	11.00*
Graettinger, Iowa	.18– .20
Indianapolis, Ind.	.10– .12a
Los Angeles, Calif.	4x8x12–5.00*
Olivia and Mankato, Minn.	9.50b
Somerset, Penn.	.18– .20
Tiskilwa, Ill.	.16– .18†
Yakima, Wash.	20.00*

*Price per 100 at plant. †Rock or panel face. ‡Delivered. ¶5x8x12, 55.00 per 1000. (a) Face. (b) Per ton. (c) Plain. (d) 8x12x16, rock or panel face, .24–.26.

Cement Building Tile

Camden and Trenton, N. J.:	
3x8x16, per 100, 9.00; 3x9x16, per 100	9.00
4x8x16, per 100, 12.00; 4x9x16, per 100	13.00
6x8x16, per 100, 16.50; 6x9x16, per 100	15.50
Cement City, Mich.:	
5x8x12, per 100	5.00
Chicago District (Haydite):	
4x 8x16, per 100	13.00
8x 8x16, per 100	20.00
8x12x16, per 100	28.00
Columbus, Ohio:	
5x8x12, per 100	6.50
Detroit, Mich.:	
5½x8x12, per M	75.00
Grand Rapids, Mich.:	
5x8x12, per 100	6.00
Longview, Wash.:	
4x6x12, per 100	5.00
4x8x12, per 100	6.25
Mt. Pleasant, N. Y.:	
5x8x12, per M	78.00
Houston, Texas:	
5x8x12 (Lightweight), per M	80.00

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.:	
Red	15.00
Green	18.00
Cicero, Ill.—French and Spanish tile (red, orange, choc., yellow, tan, slate, gray) per sq., 9.50-10.00; green or blue, per sq.	11.50-12.0
Detroit, Mich.—5x8x12, per M	67.5
Houston, Texas—Roofing Tile, per sq.	25.0
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	
3½x6x12, per M	50.00
3½x8x12, per M	60.00
Prairie du Chien, Wis.:	
5x8x12, per M	82.00
5x4x12, per M	46.00
5x8x6 (half-tile), per M	41.00
5x8x10 (fractional), per M	82.00
Yakima, Wash. (Building Tile):	Each
5x8x12	.10

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00– 40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00– 50.00
Camden & Trenton, N. J.	17.00	......
Chicago District "Haydite"	14.00	......
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Klinker	10.00	......
Ensley, Ala. ("Slagtex")	12.50	......
Eugene, Ore.	25.00	35.00– 75.00
Forest Park, Ill.	......	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50– 65.00
Los Angeles, Calif.	12.50	......
Milwaukee, Wis.	14.00	40.00
Mt. Pleasant, N. Y.	......	14.00– 23.00
Omaha, Neb.	18.00	30.00– 40.00
Pasadena, Calif.	10.00	......
Philadelphia, Penn.	15.50	17.50
Portland, Ore.	17.50	23.00– 55.00
Mantel brick—100.00–150.00		
Prairie du Chien, Wis.	14.00	22.00– 25.00
Rapid City, S. D.	18.00	30.00– 40.00
Waco, Texas	16.50	32.50–125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	......

*40% off List.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 200 mesh (94-96% thru 300 mesh), $7.00 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton. **Granville, N. Y.—Red, green and black, $7.50 per ton.**
Pen Argyl, Penn.—Blue-black, bulk, $6.50 per ton (10c additional per 150-lb. bag). Grey, 6.50 per ton.

Roofing Slate

Prices per square—Standard thickness.

City or shipping point:	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Arvonia, Va.—Oxford gray Buckingham	14.62	18.13	23.40	26.33	32.14	40.95
Bangor, Penn.—No. 1 clear	10.50–14.50	24.50	29.00	33.50	44.50	55.60
No. 1 ribbon	9.00–10.25	20.00	24.50	29.00	40.00	51.25
Gen. mediums	9.50–11.25	......	......	......	......	......
No. 2 ribbon	6.75– 7.25	......	......	......	......	......
No. 1 Albion clear	7.25–10.50	16.00	23.00	27.00	37.00	46.00
Albion mediums	8.00– 9.00	......	......	......	......	......
Chapman Quarries, Penn.—No. 1	8.50–11.25	(Vari-tone, 12.00–13.00)				
Medium	7.75– 9.00	......	......	......	......	......
Hard vein	......	16.00	23.00	26.00	32.00	40.00
Granville, N. Y.—Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green and gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Monson, Maine	19.80	24.00	......	......	......	......
Pen Argyl, Penn.*						
Graduated slate (blue)	......	16.00	23.00	27.00	37.00	46.00
Graduated slate (grey)	......	18.00	25.00	29.00	39.00	48.00
Color-tone	11.50–12.50; Vari-tone, 12.00–13.00; Cathedral gray, 14.00–15.00					
No. 1 clear (smooth text)	7.25–10.50; No. 1 clear (rough text), 8.25–9.50					
Albion-Bangor medium	8.00–9.00; No. 2 clear, 8.00–9.00; No. 1 ribbon, 8.00–8.50					
Slatedale and Slatington, Penn.—						
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1 clear	9.50	18.00	22.00	26.00	36.00	46.00
Blue Mountain No. 2 clear	8.00	18.00	22.00	26.00	36.00	46.00

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.
*Unfading grey, 10.50–12.50; textural, 12.00–15.00; 10% disc. to roofer; 10%–8⅓% to wholesaler.

Stone-Tile Hollow Brick

Prices are net per thousand f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	26.50	45.00	53.00
Brownsville, Tex.	......	53.00	62.50
Brunswick, Me.†	40.00	60.00	80.00
Charlotte, N. C.	35.00	45.00	60.00
De Land, Fla.	30.00	50.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Jackson, Miss.	45.00	55.00	65.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.	......	55.00	64.00
Los Angeles, Calif.	29.00	39.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	50.00	55.00	65.00
Mineola, N. Y.	45.00	50.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans, La.	35.00	45.00	60.00
Norfolk, Va.	35.00	50.00	65.00
Passaic, N. J.	35.00	50.00	65.00
Patchogue, N. Y.	......	60.00	70.00
Pawtucket, R. I.	35.00	55.00	75.00
Safford, Ariz.	32.50	48.75	65.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% disc.

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in., 1.35; 36-in.	2.00
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per 100 ft.	
3-in.	4.00
4-in.	5.00
6-in.	7.50
8-in.	10.00
Waukesha, Wis.—Drain tile, per ton	8.0

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8-in.	10 in.	12 in.	15-in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich. (c)																	
Sewer	.10	.12	.22	.30	.40	.60	.90	1.20	......	1.75	2.00	2.50	3.30	4.50	5.75	6.50	8.00
Culvert	......	......	......	......	.95	1.25	1.60	......	......	2.25	2.50	3.00	3.50	5.00	6.50	8.00	10.00
Grand Rapids, Mich. (b)	......	......	......	.60	.70	.90	1.20	......	......	1.80	2.10	2.35	3.50	4.00	5.60	6.90	7.85
Houston, Texas	......	.19	.28	.43	.55½	.90	1.30	......	1.70†	2.20	......	......	......	......	......	......	......
Indianapolis, Ind. (a)	......	......	......	.75	.85	.90	1.15	......	......	1.60	......	2.50	......	......	......	......	......
Mankato, Minn. (b)	......	......	......	......	......	......	......	......	......	1.50	1.75	2.50	3.25	4.25	......	......	......
Newark, N. J.	6 in. to 24 in., 18.00 per ton																
Norfolk, Neb. (b)	......	......	......	.90	1.00	1.13	1.42	......	......	2.11	......	2.75	3.58	......	6.14	......	7.78
Paullina, Iowa‡	......	......	......	......	......	......	......	2.25	......	2.11	......	2.75	3.58	......	6.14	......	7.78
Somerset, Penn.	......	......	......	......	1.08	1.25	1.65	......	......	2.50	......	3.65	4.85	7.50	8.50	......	...
Tiskilwa, Ill. (rein.)	......	......	......	.75	.85	.95	1.20	1.60	......	2.00	......	2.75	3.40	......	6.50	......	10.00
Tacoma, Wash.	.15	.17	.22	.30	.40	.55	75	......	......	......	......	......	......	......	......	......	......
Wahoo, Neb. (b)	......	......	......	......	.85½	......	114	......	......	1.81	......	2.47	3.42	4.13	5.63	6.49	7.31
Yakima, Wash.	......	......	......	......	......	......	1.42	......	......	2.11	......	2.75	3.58	4.62	6.14	6.96	7.78

(a) 24-in. lengths. (b) Reinforced (c) Delivered on job: 5% discount. 10th of month. †21-in. diameter. ‡Price per 2-ft. length.

News of All the Industry

Incorporations

Young Sand and Gravel Co., Cleveland, Ohio, $50,000.

Grimm Building Material Co., Troy, N. Y., $41,000. O. D. Connolly, Troy.

B. and B. Sand and Gravel Co., Moosic, Penn., $5200. I. H. Rosner and others.

Premier Granite Quarries, Inc., Llano, Tex., $100,000. O. E. Stolz, L. W. Stolz and C. R. Stolz.

Apex Quartz Co., St. Clair, Mo., $50,000. John W. Steinbeck, Union, Mo., and O. L. Gard, St. Clair, Mo.

East Side Sand and Gravel Co., Seattle, Wash., $25,000. H. A. Bechtel, K. B. Bechtel and C. A. Claringbound.

Jamestown Cement Products Co., Jamestown, N. Y., $100,000. Van Vlack, Bargar and Berglund, Jamestown.

Eastern Ohio Sand and Supply Co., Steubenville, Ohio, $250,000. M. H. Francis, Carl H. Smith and Harry B. Chalfant.

African Stone Corp. of America, Brooklyn, N. Y., 100 shares common stock. S. Akelmacher, 554 Atlantic Ave., Brooklyn, N. Y.

Rockdale-Corson Lime Co., Inc., Linville, Va., has reduced its minimum capital stock from $40,000 to $20,000. Philip L. Corson, president.

Arkansas Lime and Stone Co., Pulaski County, Ark., increased capital from $100,000 to $200,000, and 2250 shares to 15,000 shares, no par.

Consolidated Mica Co., Spruce Pine, N. C., $100,000. W. E. Richardson, Erwin, Tenn.; John V. Cox and James A. Maberry, Spruce Pine.

Walter J. Bryson Concrete Co., Inc., Jacksonville, Fla., 50 shares of no par value. W. J. Bryson, Sr., W. J. Bryson, Jr., and M. R. Dempster.

Ready-Mixed Concrete Co., Knoxville, Tenn., $25,000. John L. Humbard, B. P. Humbard, Joseph G. Humbard, J. B. Davis, T. L. Peters and H. L. Kidd.

Caledonia Rock Products Corp., Bristol, Vt., 100 shares of $100 each. James A. Cannon of St. Johnsbury, Vt.; George F. Badger and Mabel G. Badger of Bristol, Vt.

Granite Sand and Gravel Co., Indianapolis, Ind., 1500 shares of no par value. To acquire, lease and develop sand, gravel and stone deposits. Henry C. Morgan, C. W. Stevens and Zola Hepley.

Hydraulic Sand Corp., Chicago, Ill., 4000 shares common of no par value. To mine and sell sand, gravel, cement and building materials. Harry E. Weise, John T. McDonough, A. J. Resa. Correspondent: McKay, Resa and Russell, 160 N. La Salle St., Chicago.

Quarries

Alexander King Stone Co. of Kansas has designated Alexander King of Bloomington as Indiana agent.

Vermont Marble Corp., Proctor, Vt., is planning a 10,000-share issue of employes' $100 second preferred stock.

Falls Lime and Stone Co., Sheboygan Falls, Wis., has recently completed stripping operations uncovering a large new area for future excavation.

France Stone Co., Toledo, Ohio, has named H. H. Pifer of Toledo manager of its plant at Kenneth, west of Logansport, Ind. Mr. Pifer succeeds Charles Case.

Aurora, Ill. It is reported that the city of Aurora is making negotiations for the purchase of the Esser quarry here, which is owned by the Burlington railroad. The city wants the quarry as a city dumping ground and for a storage yard after it is filled.

Fort Collins, Colo. The Union Pacific railroad has withdrawn its application for a permit to build a line from the Buckeye branch to the new limestone quarries in the Owl Canyon region, northwest of this city. This leaves the Colorado and Southern railroad unopposed to make an extension of its Ingleside line. Both companies recently made extensive surveys of proposed extensions into the territory to reach limestone quarries which are being opened to supply limestone for use in sugar manufacture, these quarries replacing those at Ingleside, where much rock has been removed during the quarrying operations which have been in progress for approximately 20 years.

Independent Crushed Stone Co., Jacksboro, Tex., has resumed crushing operations. According to W. T. Spivey, president, the company now has enough contracts on hand to operate the plant continuously for the balance of the year, with the possibility of having to use two crews part of the time.

Daniel Evans Stone Co., Marion, Ohio, recently blasted enough crushed rock to fill orders for two months' business. An entire side of the quarry, located on the northwest edge of Marion, was brought down, releasing about 40,000 tons of stone. Nine tons of dynamite and 8500 ft. of Cordeau fuse were used.

Seybold Quarry, former Brillion, Wis., town crushing site, is to supply the town with crushed stone for road construction. The quarry is now being operated privately and the new owner has agreed to furnish the stone as needed at $1.50 per cu. yd. A crusher and storage bins at the quarry were disposed of to the new operator.

Concrete Materials Corp., Bethany, Mo., expects to resume operations again this summer. Work at the quarry was scheduled to begin early in May but was postponed until several operation difficulties were smoothed out. One of the problems is concerned with the expense of transporting the crushed stone from the quarry to the railroad tracks, this item costing about $100 per day during last year's operation. It is planned to purchase a small locomotive, quarry cars and trackage and install these at the quarry.

Sand and Gravel

Standard Gravel Co., Shreveport, La., is making preliminary plans for a gravel plant.

Dickinson Gravel Pit, Cayuga, Ind., is being rapidly put into shape and is expected to be in operation very soon.

Bruce, Wis. The Soo Line gravel pit here was opened for the season recently. It is expected that the pit will be in operation until about July 15.

Brown and Rosenburg, operating the Cyrus Stafford gravel pit near Albany, Ind., are constructing a spur track from the pit to Albany, Ind. The line will be used to connect the pit with the Muncie-Portland traction lines.

Rodgers Sand Co., Pittsburgh, Penn., William B. Rodgers, president, has acquired the principal interest in the excursion steamer "Homer Smith." A general overhauling of the boat will be made, and it is planned to have it in running condition soon.

Dartmouth, Mass. Highway Surveyor George Gifford has suggested that the city purchase a new gravel pit on Russell's Mills road at an estimated price of $1000. The pit now owned by the city does not yield sufficient gravel to meet the city's demand.

Brazil, Ind., has gone into the gravel business. As a result of an arrangement with A. M. Shattuck, who also operates a pit near Mansfield, gravel will be removed from the bed of the old city reservoir, for which the city will receive a royalty. The Indiana state highway commission is expected to be a large user.

Grant Smith and Co. is carrying out repair work to the crushers at its Edgar plant, Billings, Mont. The work is being done at night so as not to interfere with the regular production of the plant, which is busy filling orders for crushed gravel ballast for the Northern Pacific railroad. E. E. Kraig, of the Smith Engineering Works, Milwaukee, Wis., is in charge of the alterations.

Consolidated Rock Products Co., Hollywood, Calif., has petitioned the city for the right to maintain and operate a tunnel under Tejunga avenue at its Penrose plant. The tunnel was originally dug by the Consumers Rock and Gravel Co., predecessor of the Consolidated company. Permission was asked for in the name of the predecessor company in order not to complicate legal matters.

Lime

Clearwater Lime Products Co.'s new plant, located three miles east of Orofino, Idaho, has commenced operations. Walter Harr is manager.

Marianna Lime Products Co., Marianna, Fla., is erecting a plant and installing equipment to produce limestone for road base. Later it is planned to install machinery and equipment to handle limestone for fertilizer, whiting, brick, etc.

Pueblo Lime Co., Pueblo, Colo., it is reported, has plans under way for expansion and improvement of its plant at a cost of more than $40,000. The program includes new buildings and equipment to develop a capacity of about 20 tons of lime per day, as compared with present reported output of about half that amount. Jay D. Thomas is general manager.

Cement

Port Stockton Cement Co., Columbia, Calif., is said to be expending $700,000 for improvements at its quarry at Columbia.

Marquette Cement Manufacturing Co., Chicago, Ill., has let contract to S. & W. Construction Co., Shrine Bldg., Memphis, Tenn., for a cement storage and packing plant terminal at the foot of Poplar avenue on Wolf River canal, to be completed within two months. Plans call for two reinforced concrete silos, 25 ft. in diameter and 50 ft. high, with superstructure and substructure to house necessary machinery.

Cement Products

Interstate Concrete Co., Fairbury, Neb., is working on three Nebraska contracts and two Kansas contracts for concrete culverts and bridges. Manager George Yant intends to increase the capacity of the plant to take care of increased business.

American Builders, Inc., Trevor, Wis., organized in 1928, has started manufacture of ornamental cement products under a patented process. The first products to be manufactured are outdoor advertising signs and imitation fireplaces. Officers of the company are K. Hovingh, president; Wm. Doerfler, vice-president; J. Vingren, secretary, and B. Bowen, treasurer. Mr. Hovingh is the inventor of eight cement products patterns in use by the company. The company expects to open an office in Kenosha soon, from which sales and advertising will be handled.

Miscellaneous Rock Products

Carolina Mineral Co.'s mica department at Spruce Pine, N. C., has been acquired by William Richardson of Erwin, Tenn.

Annandale Graphite Co., Annandale, N. J., is said to be considering the construction of a new addition to its plant, which it is estimated will cost close to $45,000 including equipment.

Rubin Mica Co., Sylva, N. C., has sold its holdings, 2200 acres, to a New York firm which plans to develop the property. Two large mica mines are now being investigated. The company purchased a site at Dillsboro and expects to build a sheet mica and grinding plant.

Asbestos Corp., Ltd., Montreal, Que., at a recent meeting of its board of directors elected Lieut.-Col. Robert F. Massie, of Toronto, president, and Lord Shaughnessy, vice-president. Three new members were elected to the board besides Lieut.-Col. Massie who succeeds the late W. G. Ross in the presidency. The new directors are Kenneth T. Dawes, George R. Cottrelle and Walter G. Mitchell.

Personals

Henry N. Battjes was elected president of the Michigan Sand and Gravel Producers Association at the recent annual convention in Detroit.

Carl Prebble, director of the Indiana Limestone Industrial Band, has been appointed director of the Bedford Concert Band at Bedford, Ind., to fill the vacancy caused by the death of Frank L. Reed.

Arthur W. Gray, Ph.D., has joined the staff of the Brown Instrument Co., Philadelphia, Penn., as associate director of research. Dr. Gray has had considerable research experience, having established

the Thermal Expansion Laboratory of the Bureau of Standards and served as vice-president and director of the research of Dielectric Products, Inc.

Edward L. Ryerson, Jr., has been elected president of Joseph T. Ryerson and Son, Inc., succeeding Joseph T. Ryerson, who will remain a member of the board and continue to hold the office of treasurer.

The new president has had 20 years' experience in the operating and marketing divisions of the business. He was graduated from Sheffield Scientific School (Yale) in 1908 and later attended the Massachusetts Institute of Technology. Coming to the Ryerson company in 1909, he began in the plant operating department and held the position of works manager for several years prior to the war. Mr. Ryerson entered the service early in the war with the Aircraft Production Board in Washington and was later captain in the Air Service Division of the Signal Corps. He was elected vice-president of the firm in 1922 and vice-president and general manager in 1928.

Grover A. Blunt, former Dubuque, Iowa, county engineer, has been made manager of the newly organized Iowa Gravel and Fuel Co. of Dubuque, successor of Frank Beutin, Inc. The new firm took over the Beutin company recently, maintaining offices at 501 Garfield St., with its plant at the Fourth St. extension. Articles of incorporation will be filed soon.

Obituaries

Calvin Bowman, 18, employe of the Oliver King Sand and Lime Co., Knoxville, Tenn., was drowned May 17 when he fell from a barge into the Tennessee river at the King wharf.

Manufacturers

Johns-Manville Corp., New York City, at its recent annual meeting re-elected the same directors.

Brown Instrument Co., Philadelphia, has moved its Pittsburgh offices to larger quarters in the Oliver Bldg.

Fuller Lehigh Co., Fullerton, Penn., announces the removal of its New York office from 50 Church St. to 85 Liberty St.

Youngstown Sheet and Tube Co., Youngstown, Ohio, has elected Harry Creech, president of the Cleveland Trust Co., to the directorate of the company.

International Combustion Engineering Corp., New York City, has elected H. C. Woodcraft as assistant secretary, to take the place of Benjamin Henderson, deceased.

Thew Shovel Co., Lorain, Ohio, and Universal Crane Co., Elyria, Ohio, announce the removal of their Chicago sales offices to Suite 2046, Builders Bldg., 228 North La Salle St., Chicago, Ill.

Brown Instrument Co., Philadelphia, Penn., announces the appointment of two vice-presidents, as follows: Charles H. Kerr, vice-president and general manager, and George W. Keller, vice-president and general sales manager.

General Refractories Co., Philadelphia, Penn., has appointed Woodward and MaçMillan, Edificio Metropolitana, Havana, Cuba, as its sales agent for Cuba, Gautemala, British Honduras, Honduras, Salvador, Nicaragua, Costa Rica, Panama, Trinidad Island and Jamaica.

Orton Crane and Shovel Co., Chicago, Ill., has appointed Mott and McElrath Engineering Corp., 249 West 18th St., New York City, as representatives in the metropolitan district. Sales of Orton products will be under the direction of John Connell of the engineering corporation.

Fairfield Engineering Co., Marion, Ohio, has opened an office in Chicago at Room 1922, Transportation Bldg., 608 South Dearborn St. W. C. Meadows, Chicago sales representative, and Roy Franklin Rapasz, manager of railway sales, will make their headquarters at the new office.

General Electric Co., Schenectady, N. Y., announce that orders for the first quarter of 1929 amounted to \$101,365,208, as compared with \$79,925,840 for the corresponding three months of last year, or an increase of 27%. Twenty-one directors were re-elected at the recent annual meeting of the company.

Lincoln Electric Co., Cleveland, Ohio, announces that J. C. Lincoln, formerly president of the company, has been promoted to the position of chairman of the board of directors, and J. F. Lincoln, formerly vice-president, has been made president. J. C. Lincoln's new duties will afford him additional time to devote to electrical research and experimental developmnt work, which has been his major interest for the past several years. J. F. Lincoln, since becoming general manager of the company in 1912, has been an outstanding figure in the electrical industry. He was among the first to envision the potentialities of electric arc welding, and was responsible for redesigning the complete line of motors and welders manufactured by the company to utilize this process.

Hercules Motor Corp., Canton, Ohio, has recently completed substantial additions to its plant and equipment. A new building is now in full operation, with ample facilities for testing Hercules engines. The testing equipment, consisting of Sprague electric dynamometers, has been more than doubled.

American Locomotive Co., New York City, at a recent meeting of its board of directors elected William C. Dickerman as president and also as a director of the company. Mr. Dickerman succeeds Wm. H. Woodin as president. Mr. Woodin, however, will remain as chairman of the board of directors of the company.

Canda Gayley Steel Corp., recently incorporated to take over the business of the Chrome Steel Works, has changed its name to the Chrome Steel Corp. The operations continue to be at Chrome, N. J. Sidney C. Myers of San Francisco, who was for many years representative of the Chrome Steel Works, will be western representative for the new corporation.

Industrial Brownhoist Corp., Cleveland, Ohio, has purchased the McMyler Interstate Co. of Bedford, Ohio. The McMyler plant, machinery and materials are not included in the purchase, but manufacturing operations and the business of the McMyler company, together with all drawings and records, are to be moved to the Cleveland plant of the corporation.

Young Radiator Co., Racine, Wis., reports considerably greater business activity than it has ever experienced in the past, having made much heavier shipments during the past two months than at any previous period in its history. It is reported that the new Stinson Aircraft factory and hangars, near Detroit, have been entirely equipped with the Young heating system.

Leeds and Northrup Co., Philadelphia, Penn., through the purchase of adjoining property, has secured 190,000 additional square feet of property, including approximately 85,000 sq. ft. of additional floor space in a modern one-story building. The new building will be made integral with the present building by means of a connecting wing, on which construction work has already begun.

Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., at its recent annual stockholders' meeting re-elected directors James D. Callery, Paul D. Cravath, H. P. Davis and Harrison Nesbit for the term expiring in 1933. H. B. Rust was elected a director of the class whose terms expire in 1931. A. W. Robertson, chairman of the board, was elected a director of the class whose terms expire in 1932.

The Manitowoc Engineering Works, Manitowoc, Wis., announce the appointment of Wm. H. Ahlers, Box 16, Kensington Station, Buffalo, N. Y., and the Chadwick Machinery Co., 25th and Clybourn Sts., Milwaukee, Wis., as representatives for the sale of Moore Speed cranes, shovels, draglines and "Trenchoes," also the Buffalo-Manitowoc clamshell buckets, all built by the Manitowoc Engineering Works at Manitowoc.

General Electric Co., Schenectady, N. Y., announces that Neil Currie, Jr., managing engineer of the motor department of the Pittsfield Works of the company for the past five years, has been named manager of the Philadelphia Works. Mr. Currie is a graduate of the University of Minnesota and entered the employ of the General Electric Co. in 1908. Robert V. Good, section superintendent in the Schenectady Works, has been named assistant to the manager at Philadelphia.

Speeder Machinery Corp., Cedar Rapids, Iowa, has appointed H. W. Parsons as assistant general sales manager, with headquarters at the general offices at Cedar Rapids. Mr. Parsons started with the company as a shop laborer, becoming foreman of the riveting and welding department, factory service man, salesman, and then district sales engineer in the Pacific Northwest territory. Mr. Parsons is succeeded as district sales engineer in the Pacific Northwest territory by B. C. Larrabee, who will make his headquarters at Portland, Ore.

Timken Steel & Tube Co., Canton, Ohio, a subsidiary company of the Timken Roller Bearing Co., has under way an expansion program that will necessitate the expenditure of approximately \$1,000,000 during the current year. A tract of 200 acres of land, extending two miles west of the company's present holdings, has been purchased to provide room for future expansion of the plant facilities. The first unit, a tube mill, housed in a building 320 ft. wide by 420 ft. long and erected at a cost of over half a million dollars for building and equipment, is to be completed by April 1.

Northern Blower Co., Cleveland, Ohio, report that since January the plant has been unusually busy and the recent extension is working to top capacity. Among the large orders in hand are a complete dust-collecting outfit for the sacking department of the Dawson Coke and Iron Co., House-Neville Island, Penn.; another for the Lehigh Portland Cement Co., Sandts Eddy, Penn., for their grinding mill; a third for the new silo and pack house of the Coplay Portland Cement Co., Coplay, Penn., and a fourth for the San Antonio Portland Cement Co., San Antonio, Texas (dust-collecting equipment for mill room).

Wood Shovel and Tool Co., Piqua, Ohio, tell an interesting story of how their new medium priced shovel, the "Big Fist," was branded. Mr. Wood, president, reports that the fist now being used as a trademark is the biggest and horniest fist ever found on a human being. "Scores of fists were examined and photographed before we discovered this huge mass of bones and muscles," said Mr. Wood. "Finally, we came across a big burly farmer, and what a fist he had! It took 13½ in. of a tape measure to surround it. If you know of any fist to beat our 13½ in. one, we surely would like to know about it."

Foote Bros. Gear and Machine Co., Chicago, Ill., announce that their new eastern branch office is located in the Transportation Bldg., 225 Broadway, New York City, and not in the Woolworth Bldg., as previously announced. The office is in charge of E. A. Phillips, eastern sales manager. The company has also purchased a new factory in Chicago for the manufacture of quality fly wheel starter gears. The new division, which is to be in charge of John C. Phelps, also includes the production and sales of IXL silent timing gears. R. F. Crego, formerly sales manager of the L. C. Smith Bearing Co., has recently joined the Chicago sales organization of Foote Bros.

Mine & Smelter Supply Co., Denver, Colo., at its recent board of directors meeting elected A. H. Seep of Denver as president, to take the place of J. H. Fennessy, who is retiring as president after twenty-five years' service. Mr. Fennessy, however, will continue as a director of the company. Clark Grove was elected executive vice-president. H. I. Gundlach will continue as general manager of the merchandising division of the company, supervising the company's stores and warehouses at Denver, Salt Lake City and El Paso. O. H. Johnson will continue in charge of the Marcy Mill Division. A New York sales office will be maintained at 225 Broadway, with J. P. Bonardi as manager.

Novo Engine Co., Lansing, Mich., has recently appointed the following distributors for their line: Jersey Contractors Equipment Co., 1020 West Eighth St., Plainfield, N. J.; Fitzgerald and Hudson, 150 Nassau St., New York City; Fred Lemcke, Park and Liberty Ave., Jackson, Mich.; Wylie Bros., Inc., Tulsa, Okla.; R. L. McDonald, Inc., Springfield, Mo.; Anderson Tractor and Equipment Co., No. 1 Chapel road, Biltmore, N. C.; Tennessee Tractor Co., 208 Fourth Ave. S., Nashville, Tenn; Mine and Smelter Equipment Co., 316-12 South Seventh Ave., Phoenix, Ariz.; Clarence H. Buell, 404 South Clinton St., Syracuse, N. Y., and Lund and Co., 425-8 Dooley block, Salt Lake City, Utah. R. T. McClelland, Inc., Oakland, Calif., who have been Nova distributors for several years, are now located in San Francisco and are known as Krantz-McClelland, Inc., 522 Bryant St., San Francisco, Calif.

Trade Literature

***NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention* ROCK PRODUCTS.**

Drifter Drills. Bulletin on the CP-5 drifter drill manufactured by the CHICAGO PNEUMATIC TOOL CO., New York.

Aggregate Stacker. Bulletin 12 on portable, self-propelling, full-revolving stacker for storing aggregate or reclaiming from ground storage. GREENVILLE MANUFACTURING CO., Greenville, Ohio.

Diamond Core Drills. New catalog No. 85-B, in which complete equipment and supplies for use with Sullivan diamond core drills are listed and illustrated. SULLIVAN MACHINERY CO., Chicago.

Locomotives. "Hauling Economy and Efficiency" is the title of an interesting folder on industrial locomotives, built in sizes from 2½ to 35 tons or larger—gasoline or electric. GEORGE D. WHITCOMB CO., Rochelle, Ill.

Electric Control Apparatus. Four-page broadside, showing motor control installations in various plants, and outlining how problems of plant motor control may be solved. CUTLER-HAMMER MFG. CO., Milwaukee, Wis.

Mixers and Agitators. Well-written 32-page booklet, completely illustrated, and giving specifications on the company's line of agitating and mixing equipment. PATTERSON FOUNDRY AND MACHINE CO., East Liverpool, Ohio.

Cleaning Materials. Thirty-five-page booklet on general industrial cleaning, containing interesting chapters on cleaning trucks, wires, pipes and machinery with "Houghto-Clean" materials. E. F. HOUGHTON & CO., Philadelphia, Penn.